THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIII. No. 566.] LONDON, MARCH 17, 1874. [26TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL

COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.

The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.

RAMSAY'S PATENT CONDENSED COKE.
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WORKS: BRIXHAM, TORBAY.

These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.

They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.

The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov. 2, 1866.*

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PATENTEE & CONTRACTING GAS ENGINEER
FOR
SETTING RETORTS,
ERECTING AND REMODELLING
GAS-WORKS OF ANY EXTENT,
AT HOME OR ABROAD.
ADDRESS—
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COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

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Established at the commencement of Gas Lighting.
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16, SOHO SQUARE,
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35, 36, 37, & 39, GRANBY ROW, MANCHESTER.

J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.

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Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
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J. & W. ROMANS, Consulting Gas Engineers and Coal Factors, of Edinburgh and London, CONTRACT for supplying any quantity of COAL and CANNEL.

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Coal, machinery, fire goods, &c., shipped to all parts of the world.

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For the English Government, and for the Government of the Netherlands;
MAKERS OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.

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G. G. and Co. have just received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

SILVER MEDAL, PARIS EXHIBITION, 1867.

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Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

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FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS,

And all kinds of GAS APPARATUS.

Wrought-Iron Roofs, Bridges, and Girders; Steam, Hot Water, and Range Boilers; Tanks, Cisterns, &c.,

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FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

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Manufacturers of

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THE UNVARYING WATER-LINE GAS-METER,

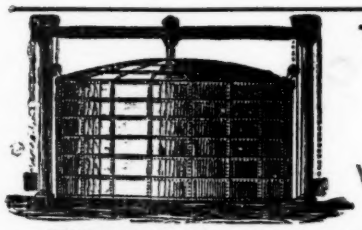
AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS,

And all kinds of Experimental Gas Apparatus.



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WHITESTONE IRON-WORKS, HUDDERSFIELD

MANUFACTURERS OF

RETORTS, ANNULAR AND PIPE CONDENSERS,

WROUGHT AND CAST IRON SCRUBBERS, PURIFIERS,

GASHOLDERS,

GOVERNORS, AND ALL THE NECESSARY FITTINGS FOR COMPLETING THE ERECTION OF GAS-WORKS.

STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

Sole Makers of B. W. Thurston's Combined Condensing, Scrubbing, and Washing Apparatus,

AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

Established

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WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

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FIRE GOODS, and Salt-Glazed Drain-Pipes.

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Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

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Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

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MANUFACTURERS OF

WET AND DRY GAS-METERS,

PRESSURE-GAUGES AND GOVERNORS, AND STREET-LAMP REGULATORS.

FACTORIES:

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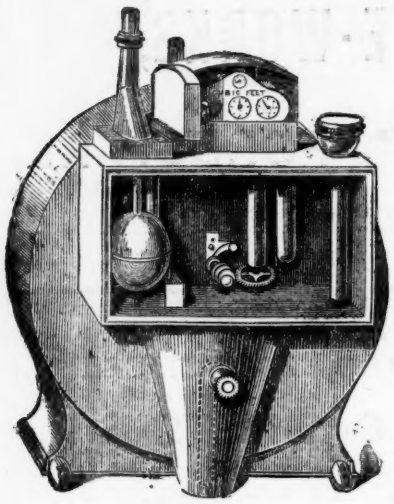


Front View.

THE

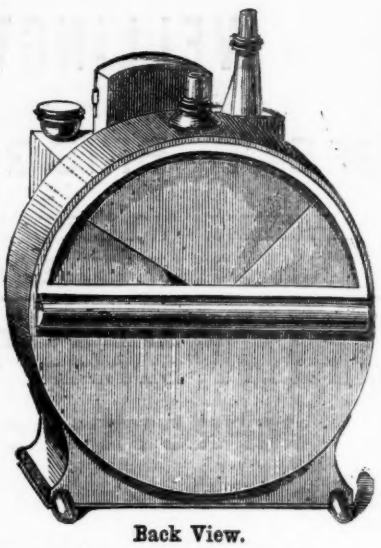
IMPERIAL

COMPENSATING

WET GAS-METER.

DE CASTRO & BURTON'S

PATENT.



Back View.

I. **This Meter is more simple in construction than the common non-compensating Meter.**
II. **An unvarying water-line is maintained.**
III. **No amount or kind of pressure will cause it to "flood."**
IV. **It is practically unaffected by "tilting."**
V. **The friction is less than in any other Meter; and**
VI. **It will last for twelve months without requiring to be refilled.**

THE IMPERIAL METER COMPANY, LIMITED, ALSO MANUFACTURE COMMON NON-COMPENSATING WET GAS-METERS OF ALL SIZES, BOTH IN TIN AND CAST-IRON CASES.

SPECIAL ATTENTION

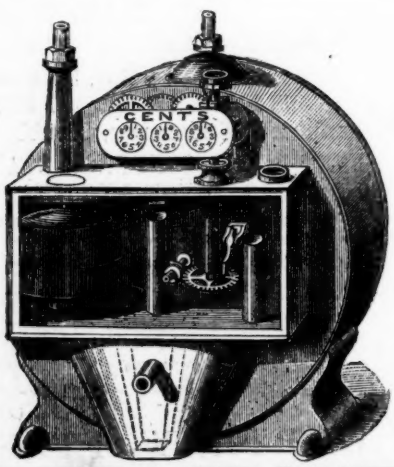
IS PAID TO THE

MANUFACTURE OF

STREET-LAMPS

AND

REGULATORS.



THE IMPERIAL WET GAS-METER.
Non-Compensator.

STATION-METERS

WITH PLANED JOINTS,

AND

GOVERNORS,

MADE TO ORDER.

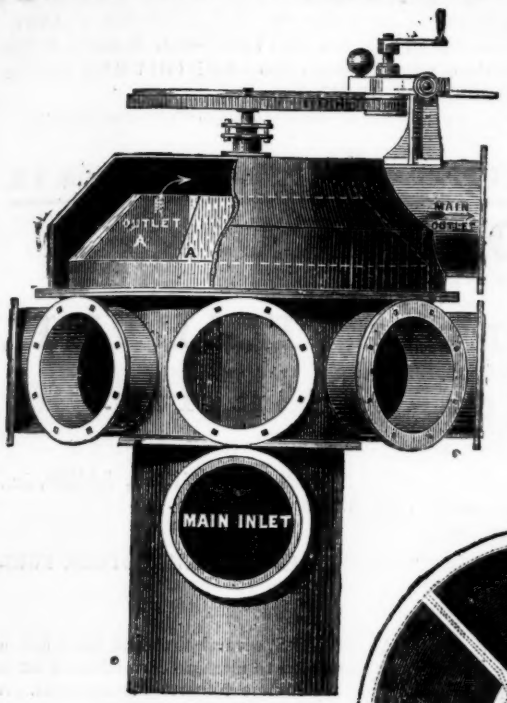
Mr. GEORGE MACKANESS will represent this Company in the Provinces.

OFFICES: 41, FLEET STREET, LONDON, E.C.

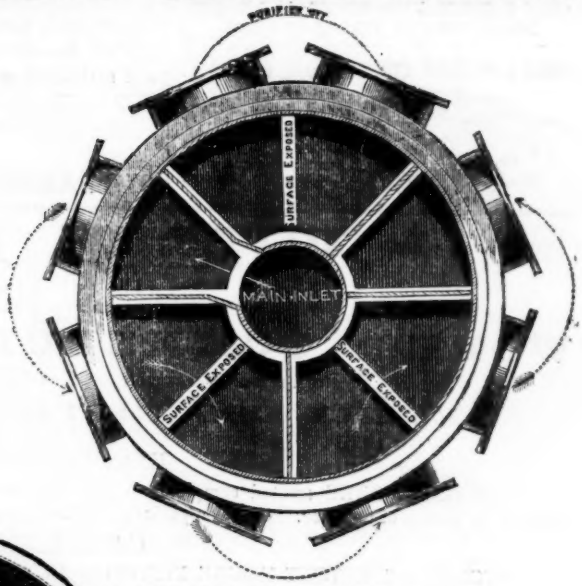
W. MOORE, Secretary.

☞ *All Communications to be addressed to the Secretary.*

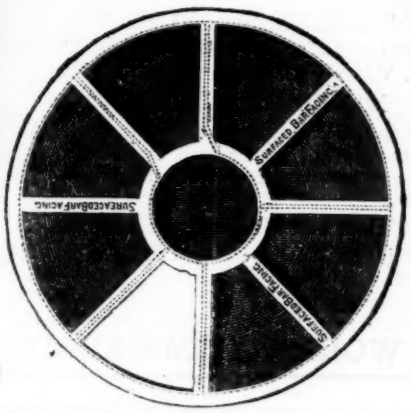
C. & W. WALKERS' PATENT CENTRE-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.



Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

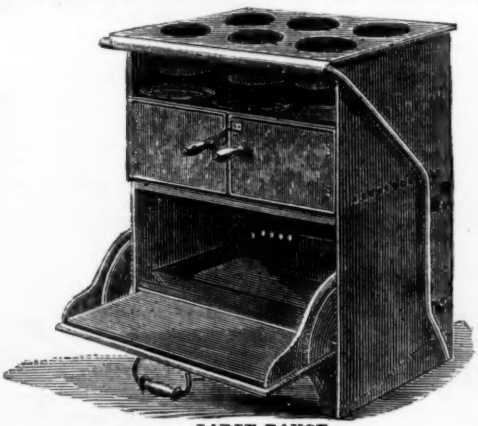
FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

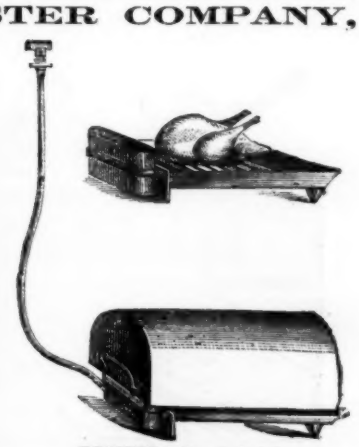
THE ECONOMIC GAS-RANGE & ROASTER COMPANY,

TABLE ROASTER.

SMALL RANGE.



LARGE RANGE.



ROASTERS, Nos. 1, 2, & 3.

ON SOUTHBY'S PATENT, WHICH SECURES PERFECT VENTILATION.

A 7-lb. JOINT ROASTED TO PERFECTION FOR ONE HALFPENNY.

SELECTED BY THE COMMISSIONERS FOR THE ANNUAL INTERNATIONAL EXHIBITIONS, 1871 & 1873.

A pennyworth of gas, perfectly consumed and economized as it is under this Patent, does as much work as six pennyworth of coal. The peculiar arrangement of cannel fishtails in a chimney secures freedom from smoke even with the richest gas, and a positive immunity from every trace of smell. The simplicity in use is so great that no experience is required. Roasters from 12s. 6d. to £1 5s. Complete Ranges at £2 4s. for small families; £3 10s. for ordinary establishments; and £6 6s. for a Range equal in power to a large Kitchener. Estimates given for fitting up Hotels, Restaurants, and large Establishments.

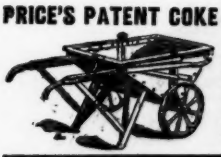
Works: 2, BASSETT STREET, MALDON ROAD, KENTISH TOWN, N.W.,

Where the Apparatus can be seen in operation;

And at Mr. WOODCOCK's Offices, 23, ABINGDON STREET, WESTMINSTER, where Mr. SOUTHBY can be consulted by appointment.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

PRICE'S PATENT COKE & COAL BARROW.



effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

THE THAMES BANK IRON COMPANY,
(Successors to LYNCH WHITE,)
SUPPLY FROM STOCK
CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.
All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.
ADDRESS—
OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

WILLEY AND FORD,
GAS ENGINEERS,
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INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF
EVERY DESCRIPTION OF GAS APPARATUS.

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.
RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.
PATTERN-BOOKS and PRICE LISTS furnished.
☞ PLEASE NOTE THE ADDRESS—
GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

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LONDON, E.C.,
MANUFACTURERS OF THE
"CHEERFUL"
GAS HEATING STOVES.

Illustrations and Price Lists sent on receipt of a Trade Card and London Reference.

SMALL COOKING STOVE.
No. 133. Size, 15 in. high, 12 in. wide, with Burner for Boiling, 35s.
Will roast a fowl, broil chops, steaks, bacon, &c.; toast bread in the most perfect manner.
Will boil water, stew, and fry, the cost for gas being about ¼d. per hour. No smoke or smell.

COMPLETE FAMILY COOKING STOVE, No. 135, £5 5s.
Size, 36 in. high; Hot plate, 22 in. wide × 16 in. deep, with 3 Burners for Boiling. If with Bright Rail, 5s. extra.
FOR ROASTING, GRILLING, BAKING, AND BOILING.
It is fitted with all the latest improvements, capable of cooking a dinner for 5 to 10 persons.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

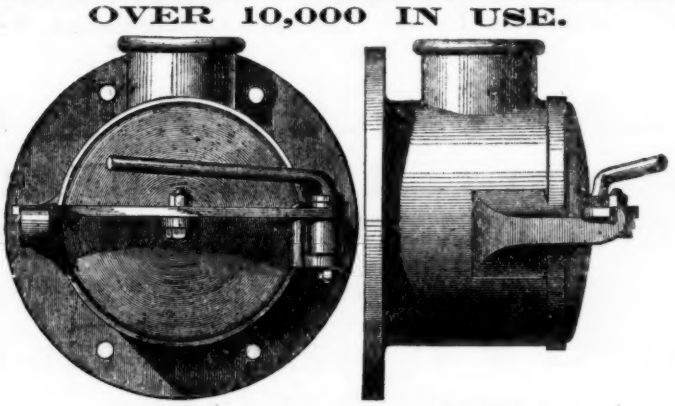
HOLMAN'S PATENT ECCENTRIC FASTENINGS.

OVER 10,000 IN USE.

NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

NO SCREWS FOR FASTENING.



FRONT VIEW. SIDE VIEW.

SIMPLE.

ECONOMICAL

DURABLE

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

These Lids are Adopted by the following (among many other) Gas Companies:—

The Gaslight Company, Beckton (where over 2000 are in use).
" Gaslight Company, Bow Common.
" London Gaslight Company.
" Independent Gaslight Company.
" Phœnix Gaslight Company.
" South Metropolitan Gaslight Co.
The West Ham Gas Company.
" Imperial Gaslight Company.
" Gas-Works, Arsenal, Woolwich.
" Commercial Gas Company.
" Alliance and Dublin Gas-Works.
" Edinburgh Gas-Works.
" Manchester Corporatn. Gas-Works.
The Salford Corporation Gas-Works.
" Rochdale Corporation Gas-Works.
" Liverpool United Gas-Works.
" Birkenhead Gas-Works.
" Birmingham Gas-Works.
" Nottingham Gas-Works.
" Newcastle-on-Tyne Gas-Works.
The Carmarthen Gas-Works.
" Merthyr Tydfil Gas-Works.
" Ystrad Gas-Works.
" St. Alban's Gas-Works.
" Over Darwen Gas-Works.
" Aylesbury Gas-Works.
" Cardiff Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

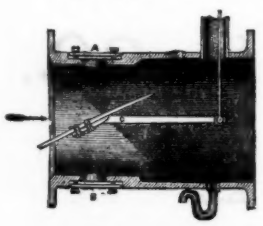
The following important Testimonial, among others, has been given:—

"*The Gaslight and Coke Company. Engineer's Office, 6, Westminster Chambers, Nov.* 14, 1871.

"Dear Sir,—In reply to your inquiry, I have the pleasure of stating that the whole of the Mouthpieces at Beckton have Morton's Lids attached to them, and they have given us every satisfaction. We have 2160 in use.—I remain, yours truly, (Signed) "F. J. EVANS."

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—i.e., it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

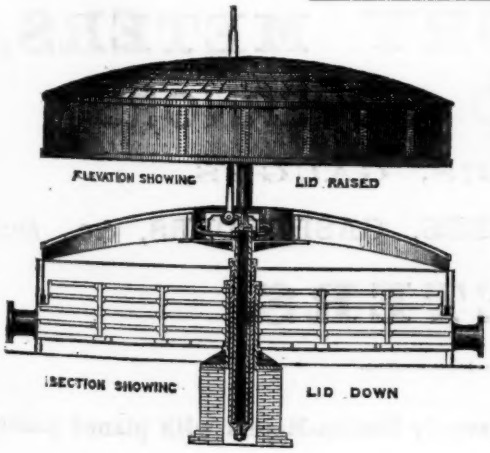
The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Company—a 24 in. at Whitechapel District Station.
" " a 36 in. at Goswell Road Station.
" " a 24 in. at " "
" " a 24 in. at the Gas-Works, Beckton.
The Gaslight Company—a 6 in. at the Gas-Works, Beckton.
The London Gas Company—an 18 in. at the Gas-Works, Nine Elms.
" " an 8 in. at " "
" " a 24 in. at " "

Also at the Gas-Works, Rochdale, Monmouth, Devonport, Cannes, and Mentone (France), &c.



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REQUIRES NO TRAVELLERS, CRANES, CHAINS, OR OTHER GEAR.

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Paris, 1867.

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5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
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NOTICE TO SUBSCRIBERS.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 17, 1874.

Circular to Gas Companies.

THE award of the commissioners for the revison of price, in the case of the Imperial Company, will be found in another column. They have granted the company an advance of 11d. per 1000 feet, which will make the price of gas to the consumer 4s. 8d. This, it will be remembered, is 2d. per 1000 less than the company's estimate showed would be required. The commissioners estimate differs from that of the company, and altogether takes a more hopeful view of the prospects of the year. We trust the result will justify their conclusions, but we cannot help thinking that some care and management will be required to make both ends meet. The estimate of 2s. 11½d., for the cost of manufacture and distribution, and general expenses, appears to us too small, but we hope it will prove sufficient.

The most important part of the award is contained in the legal opinion given by the present law officers of the Crown. We have repeatedly urged, with reference to the inquiry in the case of the Chartered Company last year, and also to the inquiries held upon applications for revision under the Gas and Water-Works Facilities Act Amendment Act, that the commissioners have no power in either case to entertain a question as to the expenditure of capital. The Acts obviously assume that the capital has been properly raised, and laid out with a view to produce a profit. Everybody knows that sometimes a gas company is compelled to spend money which, by itself, is not immediately productive; but the same thing happens with all sorts of undertakings, private as well as public, and no one thinks of cavilling at such expenditure. We are glad that the commissioners fortified themselves with an independent legal opinion, which we could hope will set the question at rest; but we see that the Corporation of London are inclined to dispute the award in the case of the Chartered Company, if made on similar grounds. We do not think, however, that they will be advised to take such a step. Next in importance is the decision that the company's reserved fund may be made up to the full amount from the profits of one year. We said, when the case was first opened, that this was, no doubt, justified by the terms of the Imperial Company's Act; but that the demand for it was impolitic. We remain of the same opinion, while congratulating the company on the commissioners decision. A loud outcry is now made against these revisions, which are held to imply nothing more than a rise of price. People forget that the legal provisions for these proceedings were rendered absolutely necessary by the low maximum prices which were forced upon the companies. But it ought to be remembered as well, that in a certain event—an event, it is true, never, in our opinion, likely to happen—the same machinery may be put in action by the Metropolitan Board of Works and the Corporation of London. Whenever these authorities deem it advisable, they can apply to the Board of Trade for a revision of price, which, in that case, will imply a reduction. We heartily wish that the time may come when local authorities will feel justified in demanding a reduction of price, for it will indicate a general state of prosperity in our industry which we have but faint hopes of ever witnessing.

Before quitting the subject of this revision, we must be excused for once more pointing out how different is the position of a metropolitan company applying for a revision under their special Act, to that of a country company applying for a revision under the Gas and Water Works Facilities Act Amendment Act. In the one case, we find a company relieved at once of all their difficulties; in the other, we find them bound to their misfortunes. We see with a little surpise that in no gas Bill presented this year have any provisions for a revision of maximum price been introduced. The general measure referred to above is only temporary—expires next year, in fact. But gas companies are not yet out of their troubles. The coal merchants called by the Chartered Company support the opinion we have repeatedly expressed, that the crisis, as it is called, is not yet over. The best gas coals have fallen very little in price, and any great fall in the value of an article in such constant and steady demand is not to be anticipated. We confidently expect that good gas coal will maintain something like its present price, and in that view the future of many country undertakings looks precarious. Concerted action will be necessary to obtain some general enactment to supersede the obnoxious Act we have referred to above, and now is the time to commence operations.

There is little to be said respecting the Chartered inquiry, which we report to-day, as far as space will allow. It will be seen that the coke contract referred to in our last has been cancelled, and no wonder. The contractors must necessarily have abandoned it, and so have ruined themselves and left the company in a difficulty. The arrangement made, by which the contractors become the agents of the company for the disposal of the coke, is the best that could possibly be adopted.

The two Birmingham gas companies have called meetings of shareholders, for the 24th inst., to obtain an expression of opinion as to the expediency of selling the undertakings to the Corporation. Considering how far the negotiations have proceeded, and the whole circumstances of the case, the result of the meetings can hardly be doubtful. The directors will, no doubt, be supported in their resolution to sell; and the only question to be discussed will be that of the terms. The offer of the Corporation, we are led to believe, is bonds, or annuities, which will practically guarantee an "average rate" of interest; but this can hardly be considered satisfactory. The Birmingham and Staffordshire Company have paid, and certainly would con-

tinue to pay, maximum dividends; and the shareholders are fairly entitled to annuities representing such interest. The old Birmingham Company, now under a cloud, would naturally, if left alone, recover their position in a few years, and become again a well-paying concern. The profits of the two undertakings, in the hands of the Corporation, will be equal; and the shareholders are entitled to equal consideration. We are not yet thoroughly informed of the terms proposed, but if they be such as are reported in the *Birmingham Daily Post*, we have no hesitation in saying that the shareholders ought not to agree to them. The Birmingham and Staffordshire Company may fairly stand out for full statutory dividends; and, at the very worst estimate, the old Company are entitled to more than the 6 or 6½ per cent. it is reported the Corporation will offer or have offered. The undertakings, in the hands of the Corporation, must be prosperous; and the shareholders ought to exact the fullest value. We wish we could see gas consumers taking more interest in the matter. When the Bill to authorize the purchase is considered, they should bestir themselves to see that surplus profits are devoted to their only legitimate purpose—the reduction of the price of gas.

As the time approaches for the consideration of the Dublin Corporation Gas Bill, public attention to the matter becomes a little roused in that city. The citizens, at all events the intelligent portion of them, are fully alive to the deficiencies of the Corporation, and they look with something like affright on the prospect of the Corporation becoming possessed of an undertaking, the success of which in their hands must depend on good management, and abstention from jobbery. A monopolist company is regarded as bad enough, but a practically irresponsible Corporation is naturally considered very much worse. What course events may take very much depends upon the action of the citizens of Dublin. The majority of these, we are certain, do not desire the confiscation of the company aimed at by the Corporation. They only wish to be well supplied with gas at a fair price, and all that is wanted the company can do as well as the Corporation. The citizens will, therefore, do well in opposing to the utmost the Corporation measure. The Bill promoted by the company is in every respect a fair one. The maximum price certainly looks high, but it is *a maximum*, and not the price the company may charge for gas. A year or two of successful management will, no doubt, enable them to bring down the charge, and at the same time pay good dividends to the shareholders. A reduction of price, if the undertaking were in the hands of the Corporation, would be a very improbable event.

Objection to the maximum price is also made in the case of the Aberdare and Aberaman Gas Company, and it is necessary to repeat that, so long as gas companies are tied down to low rates of dividend, so long will it be essential to them to have the power to charge such a price for gas as will ensure to them their profits. It may seem odd to people in Aberdare that gas should be dearer in a coal district than in London; but if they will only consider the difference in the expense of supplying a thickly and a sparsely populated district, the wonder that gas should be dear in the out-districts round Aberdare will cease.

The Town Council of Darlington are not at present doing much good with their gas undertaking. They have allowed the works to get considerably out of repair, and lose, therefore, a good deal of gas by leakage. Hence the profits have not been so large as was expected, and the necessity for a tolerably large outlay. The Town Council have evidently been "pinching"—the very worst thing that can be done in the management of a gas undertaking.

"The best article is the cheapest in the long run," is the moral of an able article, by Mr. Graham, of Stalybridge, which we publish to-day. Directors and managers of gas undertakings will follow the argument and the figures with interest, and will, no doubt, come in the end to the same conclusion as the writer.

The simplicity of a gas-tax, of so much per 1000 feet passing a station-meter, is so great that we almost wonder that our Chancellor of the Exchequer, who attempted to get a little profit out of light, did not hit on the expedient of taxing gas. In France, however, where they have to submit with more or less grace to a tax on lucifer matches, they will not endure a tax on gas. As our Paris correspondent recently informed our readers, the Minister of Finance has attempted to impose a duty of 5½d. per 1000 feet; but the Assembly have rejected the proposal by a majority of 32 votes. It was a narrow escape for gas consumers in France.

The prospectus has been issued of the "Eupion Fuel and Gas "Company." The very title is a mystification. "Eupion" was the name given by Reichenbach to the lighter oil distilled from tar, which modern science has shown to be a mixture of several hydrocarbons, but chiefly benzole—a material not likely to be used for carburetting purposes to-day. "Eupion," in the minds of the promoters of this company, means, no doubt, light petroleum spirit. The prospectus is candid enough on the point that the patentee of the process it is proposed to use is to receive £40,000 for the invention—£25,000 in cash and £15,000 in fully paid-up shares; but silence is maintained as to the name of the patentee, and it is only on reading through the testimonials appended to the prospectus that we arrive at the conclusion that "Eupion gas" is "Kromschroeder gas" under another and more euphonious name. Any one who will read the description of the apparatus given in these testimonials and in our report of experiments at Great Marlow, published at page 514 of our last volume, will have no doubt on the point. The "Memorandum of Association" is a curiosity in its way, for it would justify the company in starting in any business, from tinkering to financing. Of the testimonials attached to the prospectus we would rather say nothing. So far as we are able to judge, "Eupion gas" possesses no advantages over any other carburetted air, and we can only anticipate that this scheme will share the fate of its predecessors.

The Bath Gas Company, who stood firmly to their low price while coal was rising, have been compelled to advance their charge 6d. per 1000 now coal is falling in cost. They should have raised the price before, and then their consumers could hardly have complained; to-day they are very likely to grumble.

WATER AND SANITARY NOTES.

We regret to see that the ratepayers of Liverpool have rejected the Water Bill of the Corporation by a majority of three to one. It only remains now for the Water Committee to put in force all the powers they have for the prevention of waste; for, should we experience, as is promised, a dry summer, the want of water will be seriously felt in Liverpool. Next year, we presume, the committee will come forward with a new scheme, probably that for obtaining water from Windermere Lake. But that lake is not inexhaustible, and whatever plan is brought forward it must be accompanied by powers such as were prayed for in the Bill the inhabitants have so summarily rejected. In the end, the ratepayers of Liverpool will find that they have made a great mistake in opposing the Water Committee. The experiment with a constant supply, in a limited district, continues to work well. In a report of the water engineer, presented on the 10th inst., it was stated that the consumption under the intermittent supply during seven hours per day, before the prevention of waste, was 19·59 gallons per head per day. The daily consumption under the constant supply, before the prevention of waste, was 33·55 gallons per head. The daily consumption with a constant supply, under the waste-water meter system, at date of report—14th of November, 1873—was 13·32 gallons per head. The daily consumption under a constant supply, during the week ended the 9th inst., was 12·25 gallons per head. At the price of 9d. per 1000 gallons, this decrease in consumption represented a saving of £3000 per annum for a population of 31,000.

The "Moorfoot Bill" (as it is called) of the Edinburgh Water Trustees has passed Standing Orders, and great hopes are now entertained that it will be successful in passing both Houses of Parliament. It is also reported that the promoters of the Mid Lothian water scheme now offer to sell their Bill to the Edinburgh Corporation for £6000. If the Corporation are confident of success, they will hardly consent to this modified proposal, which looks very like an attempt to levy black-mail. The supporters of the Mid Lothian scheme made a disgraceful scene in the Leith Town Council last week, in the course of a discussion on a proposal to submit two questions to the ratepayers, which came practically to this—Would the ratepayers support the Mid Lothian Company or the Edinburgh Corporation? The question is a serious one in Leith, for if the inhabitants decide on supporting the Manor (Mid Lothian) scheme, it will involve a separation from Edinburgh.

Amalgamation is evidently desirable for the Cefn and Wrexham Water Companies. They seem to be inextricably mixed up together, and it would be far better to unite the undertakings than to engage in an expensive contest before Parliament, or in a ruinous competition in the supply of water. The Cefn Company have applied to the Board of Trade for a Provisional Order to, among other things, extend their limits of supply so as to include a part of the parish of Wrexham. The Wrexham Company have not opposed the order before the Board of Trade, but threaten to oppose the Bill for the confirmation of the order. It is said that the reason for this was a desire on the part of the Wrexham Company to avoid a local inquiry, which would have proved the superiority of the Cefn water and its comparative cheapness. Be this as it may, it is to be regretted that two companies should waste their means in contests of this kind. It would be far better to combine, and work together for the common good. We notice an ominous passage in the report of the Cefn Company, signed by Mr. Whalley, M.P.:—

Recent sanitary legislation has rendered it more than ever essential for public interests that the supply of water should, so far as possible, be taken in hand by the local authorities; for, though private enterprise is useful in developing

new sources of supply for populous districts, its interests speedily come into conflict with the public requirements, and Chester as well as Wrexham are instances of this.

Sheffield has taken alarm at the proposal of the two Wakefield Companies to impound the water of the Little Dun. A report to the Improvement Committee of the Town Council sets forth—

1. That the flood waters of the river Dun are absolutely essential for carrying off the accumulations in the bed of the river; and that if either of the bills of the Wakefield Companies pass into law, the flood waters will be almost entirely diminished, and the health of the town must necessarily suffer.
2. That if either of the bills become law, the whole of the available watershed of the river Dun will be occupied, and it will not be available for the water company or the corporation (in case the latter should at any future time become possessed of the water-works) to derive a further water supply without going to a very large expense, and trespassing upon a watershed of some other town.
3. That there is a supply of water already available in Wakefield for all purposes except drinking purposes. There is a supply for drinking purposes in the new shed of the river Calder, which might be made available for use at Wakefield without coming into the Sheffield district.
4. That the trade of the town is in a great measure dependent upon the proper supply of water to the mills and works on the river, in which a large portion of the inhabitants are employed daily.

The town have resolved to petition against the two Bills, and to take steps under the Municipal Corporations (Borough Funds) Act to obtain the sanction of the ratepayers for the expenditure of money in opposition. Why do not the Sheffield Water Company oppose?

We think it may be taken for granted that the Romford Sewage Farm does not pay. Whether it is because the sewage of exactly 6000 people does not pass on to it, or whether there are some mysteries about successful sewage farming not yet solved by so eminent a farmer as Mr. Hope, is not quite clear to us. We are half inclined to regret that the action of *The Romford Board v. Hope*, and of *Hope v. The Romford Board*, were not tried out before juries; but they were certainly fair cases for reference, and we shall learn the truth by-and-by. In the meantime, it is very disappointing to find that this much-vaunted experiment has not met with the success we were led to believe in. Mr. Hope claims £20,000 damages from the Romford Board. Does that sum represent the amount of his losses during his four years occupation of the farm?

Communicated Article.

THE TRUE PRINCIPLE OF THE VALUATION OF GAS COAL.

By D. A. Graham, Stalybridge.

The writer of this article has recently had occasion to inquire into the principles which should guide him in the valuation of gas coals submitted for approval or purchase, apart from the ordinary considerations which, in a rough and ready way, determine the relative commercial values of different qualities of this article of consumption—as also to ascertain what the relative values of various qualities should be, in relation to a particular coal which may be considered as selling at a price which fairly represents its market value, or in relation to a particular quality of coal, whose production per ton, &c., &c., may be taken to represent a standard of quality.

The inquiry began by assuming the standard quality of coal as one which should produce 10,000 cubic feet of gas per ton., considering the value in the first instance apart from the quality of the gas produced, which was left for an after consideration, where it was assumed that generally the quality will be nearly proportional to the quantity produced per ton, so that if a standard coal produced 10,000 cubic feet of 14-candle gas, a coal producing 9000 per ton would produce 12·6-candle gas.

$$\frac{9(000 \times 14}{10,000} = 12{\cdot}6 \text{ candles},$$

which, although not universally true, introduces an approximate method of valuing poor coals and comparing them with rich ones, which may be found to correspond very nearly with the production of different qualities of coal worked at similar heats.

In the following tables the limits of production of gas coal are taken sufficiently high and low to embrace the best and worst qualities in general use, namely, 8000 to 11,000.

The following table shows the quantities of various qualities requisite to produce 10,000 cubic feet of gas:—

Return per Ton.	Quantity Required to Produce 10,000 Cubic Feet of Gas.
8,000 cubic feet	1·25 ton.
8,500 "	1·176 "
9,000 "	1·111 "
9,500 "	1·052 "
10,000 "	1·000 "
10,500 "	0·952 "
11,000 "	0·909 "

The following tables show the comparative expense of working these quantities of coal of these various qualities, sufficient to produce 10,000 cubic feet of gas.

The coke a ton of coal will produce is estimated at 66 per cent. of the weight carbonized, and the fuel required for furnaces is taken as 33 per cent. of the weight of the coal carbonized, so that one-third of the weight carbonized is sold as coke, and one-third of the weight carbonized as fuel, the value of which is assumed to be 10s. per ton, being something like the average value of coke in a Lancashire town.

Tar.—The tar and ammonia water of 6° Twaddle produced from a ton of coal may be estimated at about 17½ per cent. of the weight of coal carbonized, although in the working of a rich coal, it may reach as high as 20 per cent., and taking the value of tar and water as something like 25s. per ton, the value of the tar per ton will be 4s. 4d.; but as a poor coal produces a less valuable tar than a rich coal, the increased quantity required to produce the same amount of gas will produce a greater quantity of tar and ammonia, which, however, cannot be estimated at a higher value than the quantity produced from the superior quality of coal; so that if 4s. 4d. be taken to represent the value per ton of the coal and ammonia produced from a coal producing 10,000 cubic feet of 14-candle gas, it may also be taken to represent the value of the tar produced from 1·111 ton of a coal producing 9000 cubic feet of 12·6-candle gas.

Wages.—Cost of carbonizing one ton of coal, 2s. 5d. per ton, which includes wheeling coal to retorts, charging, drawing and firing, cleaning fires, and wheeling the coke out of the retort-house.

In valuing the receipts for gas from a ton of coal, the value should be the value of the gas as produced at the station-meter, and should not be the price charged to the consumer; thus, if the average price realized in a district were 3s. 3d. at the station-meter, where the leakage was 15 per cent., the average price charged to the consumer would be in increased proportion to the 15 per cent. lost.

In a Lancashire town, a setting of retorts has on the average to carbonize from 800 to 1000 tons of coal annually; and a setting of retorts, with the connexions and roofing complete, will cost about £500; 10 per cent. on which amount is £50, which, divided by 1000 tons, equals 1s. per ton for interest on each setting of retorts; and, as it is evident that the poorer the coal the greater must be the number of settings in use, so must the interest charged be proportionally increased for working the poor coal as compared with a rich one.

The cost of renewals and repairs of retort-settings may be taken at the same amount as the interest charged per ton for settings—namely, 1s. per ton on the coal carbonized.

With these statements as the premises, we may proceed to value the receipts and expenditure in working these various quantities of coal, not taking purification into account, as it might be questionable how far proportion could be applied, the quantities of gas to be purified in each case being equal.

Coal producing 8000 Cubic Feet per Ton.

	Receipts.	Expenditure.
1·25 ton of coal, producing 8000 cubic feet per ton = 10,000 cubic feet, at 3s. 3d. per 1000	£1 2 6	—
One-third of the weight carbonized sold as coke, at 10s. per ton	0 3 4	—
One-third of the weight carbonized used as fuel in the settings, at 10s. per ton	—	£0 3 4
Tar sold, at 4s. 4d. per 10,000 cubic feet manufactured	0 4 4	—
Wages, at 2s. 5d. per ton on 1¼ ton	—	0 3 0½
Interest on settings, at 1s. per ton on 1¼ ton	—	0 1 3
Repairs and renewals, at 1s. per ton on 1¼ ton	—	0 1 3
	£1 10 2	£0 8 10½
	0 8 10½	

Excess of receipts over expenditure . . £1 1 3½

Receipts and Expenditure reduced from 1¼ Ton to 1 Ton.

Receipts	£1 4 1
Expenditure	0 7 1
Excess of receipts over expenditure	£0 17 0

Coal producing 8500 Cubic Feet per Ton.

	Receipts.	Expenditure.
1·176 ton of coal, producing 8500 cubic feet per ton = 10,000 cubic feet, at 3s. 3d. per 1000	£1 2 6	—
One-third of the weight carbonized, at 10s. per ton, sold as coke, against one-third of the weight carbonized used as fuel, at 10s., makes values of receipts and expenditure in this article equal, and may be left out of both receipts and expenditure	—	—
Tar sold, at 4s. 4d. per 10,000 cubic feet made.	0 4 4	—
Wages, at 2s. 5d. per ton on 1·176 ton	—	£0 2 10
Interest on settings, at 1s. per ton on 1·176 ton	—	0 1 2
Repairs and renewals, at 1s. per ton on 1·176 ton	—	0 1 2
	£1 6 10	£0 5 2
	0 5 2	

Excess of receipts over expenditure . . £1 1 8

Receipts and Expenditure reduced from 1·176 Ton to 1 Ton.

Receipts	£1 2 10
Expenditure	0 4 4½
Excess of receipts over expenditure	£0 18 5½

Coal producing 9000 Cubic Feet per Ton.

	Receipts.	Expenditure.
1·111 ton of coal, producing 9000 cubic feet per ton = 10,000 cubic feet, at 3s. 3d. per 1000	£1 2 6	—
Receipts and expenditure for coke equal, and not added to either column	—	—
Tar sold, at 4s. 4d. per 10,000 cubic feet made.	0 4 4	—
Stokers wages, at 2s. 5d. per ton on 1·111 ton.	—	£0 2 8½
Interest on settings, at 1s. per ton on 1·111 ton	—	0 1 1½
Renewals, at 1s. per ton on 1·111 ton	—	0 1 1½
	£1 6 10	£0 4 11½
	0 4 11½	

Excess of receipts over expenditure . . £1 1 10½

Receipts and Expenditure reduced from 1·111 Ton to 1 Ton.

Receipts	£1 4 1
Expenditure	0 4 5½
Excess of receipts over expenditure	£0 19 7½

COAL PRODUCING 9500 CUBIC FEET PER TON.

	Receipts.	Expenditure.
1·052 ton of coal, producing 9500 cubic feet per ton = 10,000 cubic feet, at 3s. 8d. per 1000	£1 2 6	—
Receipts and expenditure for coke equal	—	—
Tar sold, at 4s. 4d. per 10,000 cubic feet made	0 4 4	—
Stokers wages, at 2s. 5d. per ton on 1·052 ton	—	£0 2 6½
Interest on settings, at 1s. per ton on 1·052 ton	—	0 1 0½
Renewals of settings, at 1s. per ton on 1·052 ton	—	0 1 0½
	£1 6 10	£0 4 7½
	0 4 7½	

Excess of receipts over expenditure . . . £1 2 2½

Receipts and Expenditure reduced from 1·052 *Ton to* 1 *Ton.*

Receipts	£1 5 6
Expenditure	0 4 4¾
Excess of receipts over expenditure	£1 1 1¼

COAL PRODUCING 10,000 CUBIC FEET PER TON.

	Receipts.	Expenditure
One ton of coal, producing 10,000 cubic feet per ton = 10,000 cubic feet, at 3s. 3d. per 1000	£1 2 6	—
Receipts and expenditure for coke equal, and not added to either column	—	—
Tar sold, at 4s. 4d. per 10,000 cubic feet made	0 4 4	—
Stokers wages, at 2s. 5d. per ton	—	£0 2 5
Interest on settings, at 1s. per ton	—	0 1 0
Repairs and renewals, at 1s. per ton	—	0 1 0
	£1 6 10	£0 4 5
	0 4 5	

Excess of receipts over expenditure . . . £1 2 5

COAL PRODUCING 10,500 CUBIC FEET PER TON.

	Receipts.	Expenditure.
0·952 ton of coal, producing 10,500 cubic feet per ton = 10,000 cubic feet, at 3s. 3d. per 1000	£1 2 6	—
Receipts and expenditure for coke and fuel equal, and not added to either column	—	—
Tar sold, at 4s. 4d. per 10,000 cubic feet made	0 4 4	—
Stokers wages, at 2s. 5d. per ton on 0·952 ton	—	£0 2 3½
Interest on settings, at 1s. per ton on 0·952 ton	—	0 0 11½
Repairs and renewals, at 1s. per ton on 0·952 ton	—	0 0 11½
	£1 6 10	£0 4 2½
	0 4 2½	

Excess of receipts over expenditure . . . £1 2 7½

Receipts and Expenditure increased from 0·952 *of a Ton to* 1 *Ton.*

Receipts	£1 8 2
Expenditure	0 4 5
Excess of receipts over expenditure	£1 3 9

COAL PRODUCING 11,000 CUBIC FEET PER TON.

	Receipts.	Expenditure.
0·909 ton of coal, producing 11,000 cubic feet per ton = 10,000 cubic feet, at 3s. 3d. per 1000	£1 2 6	—
Receipts and expenditure for coke and fuel equal, and not added to either column	—	—
Tar sold, at 4s. 4d. per 10,000 cubic feet made	0 4 4	—
Stokers wages, at 2s. 5d. per ton on 0·909 ton	—	£0 2 2¼
Interest on settings, at 1s. per ton on 0·909 ton	—	0 0 11
Repairs and renewals, at 1s. per ton on 0·909 ton	—	0 0 11
	£1 6 10	£0 4 0¼
	0 4 0¼	

Excess of receipts over expenditure . . . £1 2 9¾

Receipts and Expenditure increased from 0·909 *of a Ton to* 1 *Ton.*

Receipts	£1 9 6
Expenditure	0 4 5
Excess of receipts over expenditure	£1 5 1

From these results it appears that the receipts from a ton of the various qualities of coal producing from 8000 to 11,000 cubic feet, and supposed, in the first instance, to produce gas of equal illuminating power, possess the following relative values:—

Cubic Feet.		A Difference of
8,000	£0 17 0	—
8,500	0 18 5¼	1s. 5¼d.
9,000	0 19 7½	1 2¼
9,500	1 1 1¼	1 5¾
10,000	1 2 5	1 3¾
10,500	1 3 9	1 4
11,000	1 5 1	1 4

From this table it appears that if the coals possess equal illuminating power when subjected to the same heats in being carbonized, and the one produces 1000 cubic feet less than the other, it is worth 2s. 8d. less, and so on proportionally for each 1000 less or more produced.

But another important element has to be introduced in estimating the value, namely, the illuminating power the coal is capable of producing, and if this is proportional to the returns per ton, the following table would represent the corresponding values of the illuminating power, based upon the assumption that a coal producing 10,000 cubic feet per ton, produced a light equal to 14 candles, new London burner.

In the following estimate a coal capable of producing 10,000 cubic feet of 14-candle gas per ton is assumed to be worth 20s. per ton; and a cannel capable of producing a good coke, 10,000 cubic feet per ton, and 22-candle gas, is estimated to be worth 30s. per ton. We say a good coke, for, according to the foregoing estimates, a ton of coal or cannel producing a good coke, produces an article which will sell at two-thirds of 10s., or 6s. 8d.; while a cannel, which produces an inferior coke, just loses so much in value as the worth of the coke it might have produced:—

Coal producing	10,000 feet of 14-candle gas.	. .	20s.
Cannel	10,000 ,, 22 ,,	,, . . .	30
	8 candles	=	10s.

$$\frac{10\text{s.}}{8\text{ candles}} = 1\text{s. 3d. per candle per 10,000 feet.}$$

$$\frac{1\text{s. 3d.}}{10{,}000} = 1\tfrac{1}{2}\text{d. per candle per 1000 feet.}$$

So that each candle per 1000 cubic feet, in a ton of coals is worth 1½d., or its deficiency per candle per 1000 feet, as compared with a certain standard, is worth proportionally so much less.

The several columns in the following table are compiled in the following manner:—The standard coal is assumed to produce 10,000 cubic feet of 14-candle gas, and by multiplying any of the returns per ton in the first column by the illuminating power of the coal producing 10,000 cubic feet, and dividing by the first number referred to, the quotient will give the proportional return per ton for that return per ton. Thus—

$$\frac{11{,}000 \times 14}{10{,}000} = 15{\cdot}4 \text{ candles.}$$

The third column shows the proportional increase or decrease in the illuminating power in candles above or below the standard here assumed, 10,000 cubic feet of 14-candle gas. The fourth column, the value of a candle, 1½d. per 1000 for each 1000. The fifth column, the value of the excess or deficiency of illuminating power of the gas multiplied by the 1½d. per 1000, showing the deficiency or excess of value per 1000. The sixth column, the return per ton multiplied by the value of the fifth column.

Gas Made per Ton. Cubic Feet.	Proportional Illuminating Power. Candles.	Increase or Decrease in Illuminatg. Power. Candles.	Value of a Cand. at 1½d. p.1000.	Value of the Excess or Deficiency p. 1000, at 1½d. per 1000.	Return per Ton multiplied by the Value of the Excess or Deficiency of the Value in Candles per 1000.
11,000	15·4	1·4	1½d.	2·1d.	23·1d. = 1s. 11d.
10,500	14·7	0·7	1½	1·05	11·025 = 0 11
10,000	14·0	0·0	1½	0 0	00·0 = —
9,500	13·3	0·7	1½	1·05	11·025 = 0 11
9,000	12·6	1·4	1½	2·1	23·1 = 1 11
8,500	11·9	2·1	1½	3·15	26·775 = 2 2¾
8,000	11·2	2·8	1½	4·2	33·6 = 2 9½

From this table it appears that if the standard coal be assumed to produce 10,000 cubic feet per ton of 14-candle gas, and the production per ton be proportional to the returns per ton, then the following table, with prices of coal and cannel as before quoted, would show the relative values of different coals compared with that standard:—

Cubic Feet.	Values Corresponding to Return per Ton.	Values Corresponding to Proportional Illuminating Power.	Both Values added.
	s. d.	s. d.	s. d.
11,000	1 4	1 11	3 3
10,500	1 4	0 11	2 3
10,000	1 4	—	—
9,500	1 4	0 11	2 3
9,000	1 4	1 11	3 3
8,500	1 4	2 2¾	3 6¾
8,000	1 4	2 9½	3 1½

The last column shows the difference in value for each increase or decrease per 500 per ton, *plus* the corresponding proportional increase or decrease in the illuminating power of the gas; and the following table shows how these values compare with the 10,000 per ton of 14-candle gas, taken as the unit of comparison:—

Candles.			
15·4	11,000 cubic feet is worth	5s. 6d. more	Than a coal producing 10,000 cubic feet of 14-candle gas, coal at £1; cannel of 22-candle gas, 10,000 to the ton, at 30s.
14·7	10,500 ,, ,,	2 3 more	
14·0	10,000	—	
13·3	9,500 ,, ,,	2 3 less	
12·6	9,000 ,, ,,	5 6 less	
11·9	8,500 ,, ,,	9 0¾ less	
11·2	8,000 ,, ,,	12 2¼ less	

And, on these assumptions, a coal producing 11,000 cubic feet per ton is worth 17s. 8¼d. more than a coal producing 8000 cubic feet per ton; a coal producing 10,500 is worth 7s. 9d. more than one producing 9000 cubic feet of 12·6-candle gas, and 11s. 3¾d. more than a coal producing 8500 cubic feet.

In conclusion, if the foregoing remarks show anything at all, is it not that a gas company may not pay best, or be placed in the most favourable position for competition with other companies, whose apparatus and retorts are in the most perfect condition? But the question must also be asked—May they not pay too much for inferior qualities of coal, which may nominally pass for cheap, but are bought at prices which, in practice and on examination, are found to be ruinously dear? And is not the success of some particular companies, who manufacture 18-candle gas, or a gas of nearly similar quality, very largely to be attributed to the use of coals which give large returns per ton of gas of a superior quality, only requiring mixtures of small per centages of cannel, and producing a coke which has always a ready sale at high prices, such coals also returning large per centages of valuable tar and ammonia water? And are not such coals relatively much cheaper than great numbers of gas coals which are currently held to be cheap at the prices they usually fetch in the market?

ACTION OF WATER ON SHEET LEAD.—M. H. Maraes considers sulphide of hydrogen as the most sensitive reagent for salts of lead in water. It gives with milk, containing 1-10,000th of lead, a flesh-red colour. The author does not admit that the presence of calcareous carbonate and sulphate renders water incapable of acting upon lead. Turnings of lead, placed in water containing an excess of the carbonate and bicarbonate of lime, were gradually acted upon, and after standing for 20 days, the water was distinctly coloured by sulphide of hydrogen.—*Comptes Rendus.*

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

V.

Historical Introduction.

(Continued.)

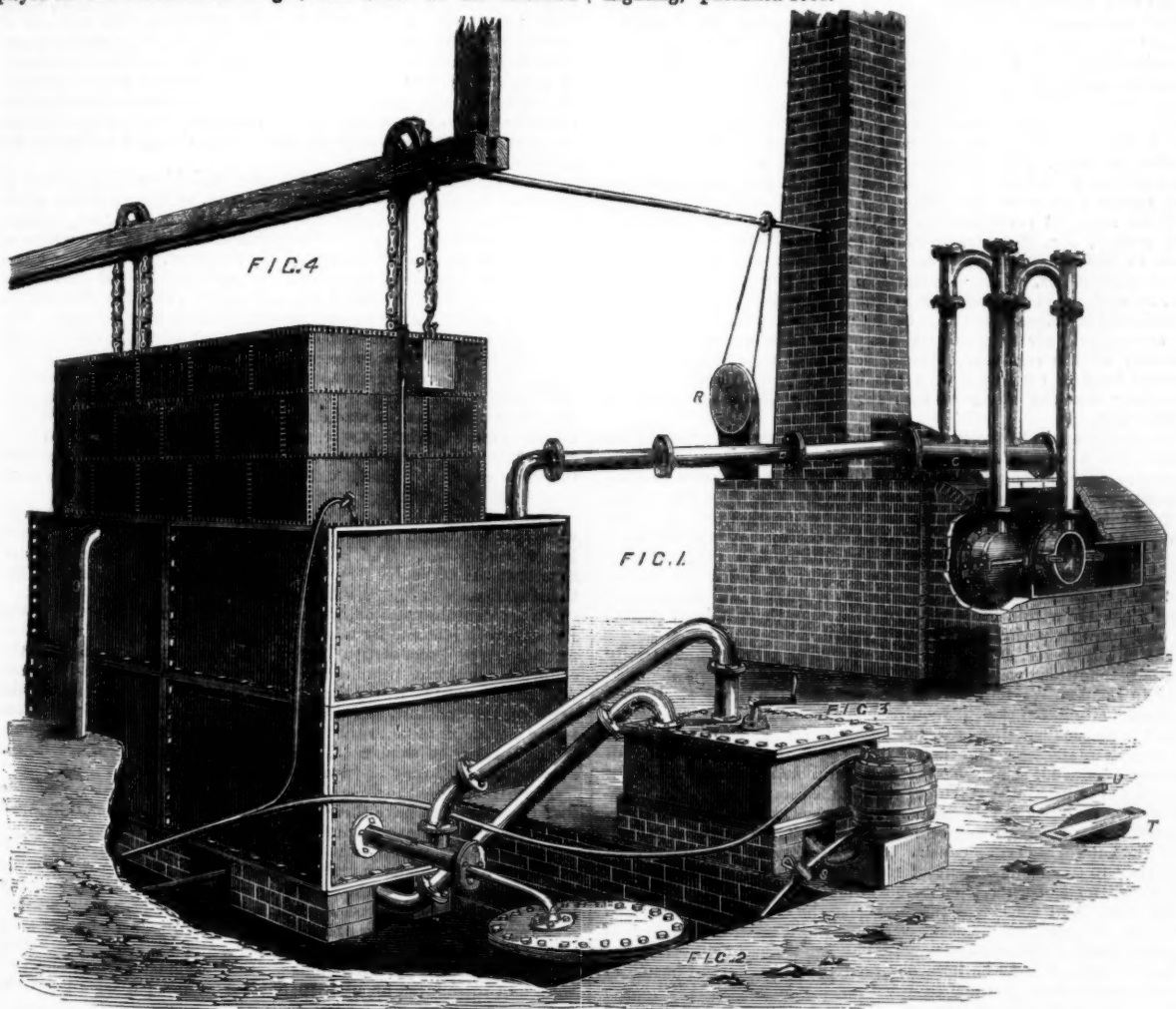
But whilst Winsor was thus engaged in directing public attention to the utility, and endeavouring to establish a company for the general development of, gas lighting, others were actively employed in carrying the new art into practical operation, for early in 1804 Mr. Lee (already referred to), had his dwelling lighted by gas, in order to test its various advantages before deciding on its general adoption in the extensive cotton-mills of his firm. The following year the greater part of those premises were thus illuminated, and a few months afterwards the whole, comprising upwards of 900 lights, was completed, under the direction of Mr. Murdoch, on behalf of the firm of Boulton and Watt.

A most interesting account of the application of gas just mentioned was communicated by Mr. Murdoch to the Royal Society, in 1808, for which he was awarded Count Romford's gold medal. The description was speedily copied into the various public journals, and attracted much attention, leading unquestionably to important consequences, as it proved by facts and actual operation, on an extensive scale, the practicability of what had been so often regarded as visionary and absurd.

The construction of gas apparatus became a part of the business of the Soho Works for a few years, and by that firm gas lighting was introduced into various manufactories; among which may be mentioned those of Messrs. Burleigh, of Manchester; Mr. Gott, of Leeds; Mr. Kennedy, also of Manchester; Messrs. Peter, of Kirkland, near Leven, where cannel coal was first practically employed for the manufacture of gas, and where we are informed part of the original apparatus is still in use. These and other gas-works had been erected, and were in operation at the time of the parliamentary investigation referred to. But it appears that neither Boulton and Watt nor Murdoch continued long to follow this branch of industry, but devoted themselves more particularly to the manufacture of steam-engines, in the construction of which, as we learn from Bourne's "Treatise on the Steam-Engine," Murdoch added to his great reputation by the invention of the eccentric and rod, for giving motion to the slide-valves of engines, an invention alike remarkable for its simplicity, efficiency, and general application. By this and his other great merits, Murdoch very deservedly acquired a competent independence.

Mr. Samuel Clegg, who had been a pupil at the Soho Works, and subsequently distinguished himself in a remarkable manner by the invention and construction of apparatus used in gas lighting, applied himself, in the year 1805, solely to the manufacture of gas apparatus, and during that year the cotton-mill of Henry Lodge, Esq., near Halifax, was by him lighted with gas. The following year he lighted in like manner that gentleman's dwelling-house, where the first attempt was made to purify gas by introducing lime into the tank of the holder. In 1807 he lighted the manufactory of Messrs. T. and S. Knight, of Longsight, near Manchester.

In 1809 Mr. Clegg erected a gas apparatus in a large manufactory at Coventry belonging to Mr. Harris, in which he introduced a paddle at the bottom of the tank to agitate the lime. Early the same year he communicated to the Society of Arts his plan of an apparatus for lighting manufactories with gas, for which he was presented with a silver medal. In 1812 the extensive cotton-mills of Ashton Brothers, at Hyde, near Stockport, were lighted. Here he introduced the wet-lime machine and hydraulic main; and in the same year the premises of Mr. Ackerman, a publisher in the Strand, were lighted with gas by him, of which works we present an engraving, copied from the frontispiece of Accum's "Treatise on Gas Lighting," published 1815.



Gas-Works constructed by S. Clegg for Lighting the Premises of Mr. Ackerman, 1812.

Fig. 1.—The furnace, with the retorts, A A, placed side by side. The door of the furnace is also shown.

Fig. 2 is the receiver for the tar to collect the bitumen and other products condensed after the distillation. This is a cast-iron cylinder closed at the top, with a small hole to allow the air to escape when the liquid enters the vessel.

Fig. 3 is the lime apparatus to purify the crude gas and render it suitable for burning. This contains lime mixed with water, through which the gas is caused to pass and become purified.

Fig. 4 is the gasometer for receiving and retaining the purified gas and to distribute it at will. This consists of two principal parts—viz., first, a large internal vessel, closed at the top and open at the bottom, constructed of sheet iron, and destined to receive the gas; second, an external cast-iron vessel of larger capacity than the former nearly filled with water, and in which the other vessel is suspended.

At the commencement of the operation the internal vessel, being at the bottom, is entirely filled with water; but as the process of distillation takes place in the retorts, the gaseous products evolved from the coal are conveyed by the vertical syphons, B B, to the horizontal pipe, C, with which they are connected.

The liquids collect in the condenser, C, where they remain until there is a sufficient quantity to pass by the pipe D, which is attached to the condenser, C. The ends of the pipes, B B, are immersed in the liquid contained in the condensers, whilst the gases and vapours, after surmounting the pressure, pass in the pipe E, which has a serpentine form, within the outer vessel or gaso-

meter, as shown by dotted lines, and so passes out at bottom, E, which conveys the tar and other substances condensed in the serpentine pipe into the tar receiver (fig. 2), whilst the permanent gas pass by the pipe, F, into the lime machine, where it is purified.

This done, the purified gas is conveyed from the purifier by the other pipe, G, to the gasholder, by means of a vertical pipe, into the gasometer, where the gas, being exposed to a large surface of water, is washed and purged of any impurities it possesses after leaving the lime machine, where it has been agitated with that substance mixed with water.

The gasometer rises in proportion to the quantity of gas accumulated, whence it passes to the burners to be supplied.

L is a barrel containing a mixture of lime and water for supplying the lime vessel by the bent pipe. A bent lead pipe supplies water to the gasometer; also to the barrel L.

O is an overflow-pipe to carry off any excess of water. P is a crank for occasionally stirring the lime and water in the purifier. R is a dial set in motion by an endless cord passing over a pulley fixed on a shaft worked by one of the wheels of the gasometer. This dial is divided, and shows the number of feet contained in the gasometer. T is an iron door for hermetically closing the retort. U is a wedge by which the door is secured.

In the *Monthly Magazine* for April, 1805, appeared a communication by Mr. Northern, of Leeds, giving an account of some experiments made by him on the production of coal gas, which he concludes by observing:—"I have great hopes that some active mechanic or chemist will, in the end, hit upon a plan to produce light for large factories and other purposes at a much less expense by coal gas than is at present incurred from oil."

Mr. Pemberton, of Birmingham, made a series of experiments on the production of coal gas and its application to lighting, and exhibited gaslights in a variety of forms in front of his establishment in one of the main streets of the town; and in 1808 he erected a gas apparatus for Mr. Cook, a toy manufacturer, by whom gas was employed for soldering purposes. From that time Mr. Pemberton devoted himself to the construction of gas-works.

It was not, however, by practical mechanical men alone that gas lighting was thus slowly, yet surely advanced, for men of science also contributed their aid, and most conspicuous amongst these was the celebrated chemist, Mr. (afterwards Dr.) Wm. Henry, who, at the latter part of 1804, delivered a course of lectures at Manchester, in which he showed the mode and facility of producing gas from coal, with the advantages of its use, as a means of obtaining artificial illumination; also the means of burning it in an Argand lamp, as had been already done by Murdoch. He subsequently analyzed the composition and investigated the properties of coal gas, with that careful regard to accuracy which characterized all his inquiries, and in his numerous experiments he produced gas from a variety of bodies, as wood, peat, different kinds of coal, oil, wax, &c., and endeavoured to arrive at the relative value of each description of gas, for the purpose of lighting.

From repeated investigations of various compounds of hydrogen and carbon, Mr. Henry ascertained the ingredients which contribute to the illuminating power of coal gas, and he advanced many suggestions, which conduced to improvements in producing gas, as well as in its purification from substances that might be offensive or injurious to health. He likewise ascertained the quantity of atmospheric air requisite for its proper combustion, with the quantity of the resulting carbonic acid, and numerous other important facts in connexion with gas lighting; and to Mr. Henry is especially due the merit of first suggesting lime as a means of purification.

Returning again to the operations of Winsor, we find amongst his subscribers were gentlemen of the greatest intelligence and perseverance, who, although defeated in their first application to Parliament, were far from being discouraged. The following year, therefore (1810), they again applied to be incorporated as "The London and Westminster Gaslight and Coke Company," and although they had to contend against great opposition, and incurred considerable expense, they succeeded in obtaining an Act of Incorporation, and a declaration that His Majesty, if he saw fit, might grant them a charter within three years, constituting them a body politic, for and during a period of 21 years thereafter.

The bill, however, as introduced the previous year, was materially altered—conditions were imposed limiting the powers of the company to London, Westminster, Southwark, and the suburbs. It was, moreover, stipulated that, if required, the company should contract with the various parishes of London, Westminster, and Southwark to furnish a stronger and better light, and at a cheaper rate, all expenses included, than such parishes could be supplied with oil if lighted in the usual way. The capital of the company was limited to £200,000, to be raised in shares of £50 each, and they were prohibited from exercising any of the powers granted by the Act until half the capital was subscribed. Other restrictions were introduced referring to the management of the company, such as the appointment of the governor, deputy-governor, directors, the value of votes, &c. And thus was the first gaslight company established "for the purpose," as was said, "of making a great experiment of a plan of such extraordinary novelty."

Incidentally, it may be here observed that the Royal Charter of Incorporation was granted to the company in April, 1812, from which period, for nearly 60 years after, it was called the Chartered Gaslight and Coke Company.

The gas company being incorporated, and the first capital available, operations were commenced, with the view of realizing the great profits so fondly hoped and expected. Hitherto, all had been merely experiment, the simple production of illuminating gas on a very limited scale, without any consideration as to cost; but now it became imperative to carry the new art into practical operation on a gigantic scale, and, above all, to make it commercially a profitable enterprise, and this under the greatest disadvantages; for, although gasholders had been recently introduced, and cast-iron water-mains were then just being adopted, beyond this, almost everything had to be invented, calculated, designed, and constructed, in order to arrive at a successful issue.

The indispensable requirements for the manager—or, more properly speaking, engineer—of such an undertaking, were, good mechanical knowledge and skill, some acquaintance with physics generally, an inventive mind, together with considerable energy and perseverance. No mean combination of qualities at any time, but at that period exceedingly rare; and, unfortunately for the first success of the company, the directors did not understand these qualifications to be essential for their engineer. So their choice for that post fell on Accum, to be aided by Hargreaves—a chemist and a medical man! Some reason may be assigned for the appointment of the first, but it must ever be doubtful whether Hargreaves's knowledge of veins and arteries could be of any assistance in the laying of mains and services.

The engineer appointed, premises, consisting of a wharf adjoining the Thames, in Cannon Row, Westminster, were then obtained, where costly apparatus was constructed and more costly experiments entered into; without, however, attaining any definite object. Whether from caprice or necessity, the locality was found inconvenient, and was relinquished; and in an evil hour for the future interests of the shareholders of the Chartered Gas Company, the directors decided on taking premises in Peter Street, Westminster; afterwards others in Curtain Road; and lastly in Brick Lane, St. Luke's; all of which stations were situated in populous neighbourhoods, where ground for extensions had subsequently to be purchased at fabulous prices, and each was at a considerable distance from that almost indispensable requirement, water-side communication.

This choice of premises was a most egregious and unpardonable error, by which, during the 57 years the manufacturing operations were carried on at those stations, an incredible amount was expended for loading, and unloading, and cartage of coal, &c., from the various wharves to the works; and there is no exaggeration in estimating this needless expenditure at half a million sterling—a loss which the slightest foresight or exercise of common sense at the time, would have prevented. But, as will be seen hereafter, this was one of several errors of the directors of that company, who gradually permitted their enterprise to descend from the first and most prominent, to a secondary position, and, by degrees, allowed their district to be limited to that portion of the metropolis where no extensions could be made, leaving the suburbs, with their vast augmentations, to rival companies—a state of affairs only changed within the last few years.

Meanwhile the operations of Accum and his colleague were of the most unsatisfactory nature; absorbing, by their fruitless operations, the greater portion of the first instalments of £10 per share, without advancing towards the accomplishment of the wishes of the directors and shareholders of the company. Difficulties, disappointments, vexations, and anxieties, quickly succeeded each other, and such was the discredit of the undertaking, that the shares of the company would hardly realize one-fifth of their nominal value.

At this critical epoch, the commencement of 1813, the company had the good fortune to engage Mr. Samuel Clegg, already mentioned, as their engineer, who, by his experience, knowledge, ability, and energy, was eminently qualified for the position. From that time their operations assumed a practical form, and, under his able direction and superintendence, the works at the three stations were constructed, the mains supplying a limited portion of London laid, the other necessary details executed; and on Dec. 31 of the same year Westminster Bridge was lighted with gas.

The first mains laid by Clegg were two inches diameter, but these were speedily found to be too small, and were replaced by others of larger dimensions. The capacity of the first gasholder at Peter Street was 14,000 cubic feet, and in 1814 the united storeage of the three stations was 52,000 cubic feet.

An accidental explosion, which occurred about this period at the Peter Street station, by which Mr. Clegg was injured, seemed to menace the progress of gas lighting, as it gave opportunity for the confirmation of the prophesied dangers attending the use of gas. A committee of the Royal Society was appointed to inquire into the cause of the accident, and their investigation and report were eventually conducive alike to the interests of gas companies and the public, by leading to some useful alterations and modifications of the apparatus, while they inspired confidence and dispelled fears.

The parochial authorities of St. Margaret's, Westminster, were the first to contract to have their streets lighted with gas, and in April following this was carried into operation.

By the practical application of gas to the lighting of public streets, as well as for a few private houses, popular opinion was speedily changed, as we find by the establishment of the City Gas Company in 1814, which commenced operations in Dorset Street, Blackfriars, on premises formerly occupied by the New River Company as a wharf for landing timber, and as offices, and workshops for boring wooden pipes used for water-mains. Cast-iron mains for this purpose were first introduced about 1810, but the laying of wooden pipes was not entirely abandoned for some years afterwards.

Clegg's great success was not, however, sufficient to counteract the difficulties created by his predecessors, as we find in June, 1814, the Chartered Company applied to Parliament for an extension of time to raise their capital, which was granted, and from this period, for a time, the career of the company was one of comparative success, their business increased in an astonishing manner, demanding a considerable augmentation of their establishments, apparatus, mains, &c., for which purpose they again applied to Parliament, in 1816, for powers to extend their capital by a further sum of £200,000

The usual parliamentary investigation took place on this occasion, and several witnesses, manufacturers, and shopkeepers of varied positions, deposed to the economy and other advantages of gas lighting. By them the cost of light from gas was estimated at from one-third to one-fourth of that obtained from oil lamps; the saving of labour, cleanliness, security from fire, and the facility of distinguishing colours, were also described as important advantages of gas lighting.

Police officers from Worship Street and other places gave evidence of the great importance of gas lighting in preventing robberies, and they mentioned instances where the perpetrators of these crimes had been apprehended by the aid of gas lighting; also that three-fifths of the oil street lamps were extinguished before midnight, and when in winter the lamplighters went round to trim their lamps, the thieves used to borrow their ladders for the purpose of committing robberies, and that a nobleman's mansion had been thus plundered. Mr. Clegg, who gave evidence at the inquiry, stated that if the company lighted the public lamps only, they would sustain a serious loss, the number of these then supplied was 7000, and at their Peter Street station they had five gasholders, each containing about 15,000 cubic feet of gas. The inquiry resulted in the company being authorized to increase their capital; but, at the same time, a restriction was imposed upon them, that their proceedings were to be subjected to the inspection and control of the Secretary of State for the Home Department.

(*To be continued.*)

Correspondence.

THE INFLUENCE OF DIFFERENCE OF LEVEL ON GAS PRESSURE AND ON THE REGISTRATION OF METERS.

Sir,—Agreeing altogether with the principles laid down by your accomplished correspondent, W. P., I will, with your permission, make a few observations on the same subject.

Adopting the general data and construction of your correspondent, any factors that are not essential to the question may be suppressed, and it may be convenient to refer all weights and pressures to head of water.

The 1 inch of pressure shown by gauge in lower district, or say at bottom of gas column, is only that due to the pressure in the main, and may be called the mechanical pressure. It does not begin to show until the other pressure, due to the natural elasticity or density of the gas, has attained its maximum, and may therefore be done away with. Supposing, then, that there are two columns, one of gas and one of air, they will be both in precisely the same condition at bottom as regards pressure.

If, with barometer at 30 in. and temperature at 60° Fahr., the densities of water and air be taken at 62·3674 and 0·07637 respectively, dividing the latter by the former, we have 0·00122458 as the weight of a 1-foot column of air expressed in feet head of water. A column of air 100 feet high may, therefore, be taken as equivalent to 0·122458 expressed in feet, or very nearly 1·47 expressed in inches head of water.

The weight of the column of air being equivalent to 1·47 inch of water, it is evident that the column of gas of similar height, and the mean specific gravity of which, compared with that of the column of air, is as 0·47 to 1·0, will only be equal to $1{\cdot}47 \times 0{\cdot}47 = 0{\cdot}6909$ inch head of water. There cannot, therefore, be equilibrium between the two until the difference of their weights—viz., 0·7791 inch of water be added to the gas column. Each column being closed by a pressure-gauge at top, and exposed to atmospheric pressure at bottom, it will be found that while the gauge on the air column remains level, that on the gas column will show a pressure of 0·7791 inch of water, the difference mentioned.

If an imponderable gas could be used, the pressure shown at top should be equal to the weight of the column of air—viz., 1·47 inch head of water. If hydrogen, it should be $1{\cdot}47 - (1{\cdot}47 \times 0{\cdot}065) = 1{\cdot}374$ inch, and in like manner with all other gases; the difference, in the case of gas of greater density than air, being shown on the other side of the gauge.

Taking the density of mercury at 13·568, the atmospheric pressure at bottom of each column alike will be 407·04 inches of water; but while the air column at top will only sustain a pressure of 405·57 inches, that of gas of 0·47 sp. gr. will sustain 406·349 inches. It follows that 1000 cubic feet of air measured at bottom will measure 1003·62 if transferred to top, whereas 1000 cubic feet of the gas will measure only 1001·7 at top.

From the foregoing it appears that, in a district 100 feet above the works, where the pressure in the mains is excessive, the meters, being checked or governed on their outlets, should only register 0·17 per cent. more than they would near the works. But that, if the pressure is kept down in the higher district, as it may and should be in the interest of the gas company, the pressure, as shown by the pressure-gauge on the inlets of the meters in both districts, should be the same, and those in the higher district should register 0·36 per cent. in excess of the others.

My only excuse for so far intruding upon you, after the exhaustive exposition of your correspondent, is that such questions may sometimes be popularized by being examined from slightly different points of view.

The writer has only to add that, 12 or 14 years ago, he had constructed and used an instrument to test the specific gravity of gas, on the principle referred to—viz., a vertical tube and pressure-gauge. Only one gauge was employed, and that ultimately adopted was of the kind first suggested, it is believed, by the patentees of the Sanders and Donovan gas-meter. The proposed application is, therefore, not quite new.

London, March, 1874. A. P.

GAS-FITTINGS ON HIRE.

Sir,—In 1864, being then manager of the Parà Gas Company, I adopted the system of letting gas-fittings on hire, and, I think, may claim to have been the first to do so.

The result has been that, although started 18 months later, the private consumption of that company is now double that of Maranham, a neighbouring town of a superior class and greater population, and I believe fully equals that of Bahia, which, with five times the number of inhabitants, had also been lighted up before Parà.

Chandeliers and brackets were not furnished, these being considered as moveables, which the tenant had the same right over as his other furniture.

There would, however, be a danger in this system should a competing company come into the field, as it is questionable how far any agreement made with the landlord could be enforced, but there is little doubt that, where competition is unlikely, private consumption can in this way be greatly stimulated.

Had it not been for this arrangement, I believe the works cited would not for several years have done more than clear expenses, as a difficulty in the matter of fittings between landlord and tenant was at once encountered; the one did not choose to lay out further capital without a corresponding increase of rent, and the other had, by the laws of the country, no security should he himself undertake the outlay.

Although my opinion is that everything beyond the actual pipeage should belong to the tenant (meter and service fittings excluded), still I think that, without great danger of loss of capital, and with, on the other hand, mutual advantages to companies and consumers, gas cooking-stoves might be hired. Were facilities of this kind offered in houses where no servants are kept, and especially in the summer time, when warmth is little called for, the cleanliness and (properly managed) the economy of this mode of cooking would soon be recognized as valid advantages, and conduce to popularize its adoption.

A. F. Wilson.

18, *Buckingham Street, Adelphi, March* 9, 1874

TAR AS FUEL.

Sir,—With reference to letters of Jan. 13, from Mr. Nettleton, of New York; of Jan. 19, from Mr. Anderson, of London; and of March 3, from Mr. Walker, of Milwaukie, U.S., I beg to state that in a large works (350 retorts) with which I was connected 44 years ago, we used all our tar as fuel without distillation, without grinding, and without any addition of coke. Tar never appeared as a receipt in our accounts.

The process was simple—nearly that described in Mr. Nettleton's letter—tar tanks over the retort-beds, services to convey it to the furnace door (or shoot), into the furnace, and a small tap regulated to give a stream of tar about one-eighth of an inch diameter. It was a cutting flame, but in those days the "barbarous" iron retorts were well shielded with fire-bricks and tiles, to prevent their feeling the fuel wasted. Yet they often would not last more than three months either with coke or tar, and their average life was not more than ten months, and the average charge they had taken (D's, 7½ feet, 13-inch) not more than 49 lbs. Still, when *new*, they would take 150 lbs. per charge, or a bed of sixes would carbonize nearly 36 cwt. of coals in 24 hours, using as fuel 12 to 13 cwt. of coke; a chaldron of coke, 13 cwt. (or, as we delivered, 42 bushels), would go as far as a butt of 108 gallons of tar. The coke sold at that time for about 14s. per chaldron; consequently, we realized for tar about 14s. per butt, or about 1½d. per gallon for a worthless drug at that time. We continued so to use it until coke fell in price, and the patent fuel companies purchased the tar for more than 14s. per butt.

There was, with the greatest care, a slight evolution of smoke, more than enough to raise the ire of Inspector Sandison in these days.

An Old Ex-Secretary.

[We have received a further communication on the same subject from our esteemed correspondent, which will appear in our next.—Ed. J. G. L.]

FOULIS'S HYDRAULIC STOKER.

Sir,—When in Glasgow a few days ago, Mr. Foulis courteously afforded me the opportunity of seeing his new stoker in operation. From the pithy description of it in your issue of the 24th ult., I was prepared to see a comparatively simple machine satisfactorily performing this difficult work; but the reality quite exceeded my expectations. So simple, light, and strong are both machines (the one for discharging being separate from that for charging), and so quietly and rapidly do they perform their work, that I believe no one could see them doing it without feeling convinced that they are just the machines required.

Mr. Foulis's idea of adopting hydraulic instead of steam power for this purpose is a most happy one, and places his machine in quite a different category to the cumbrous steam stokers, so far, of only questionable utility. This water power being conveyed overhead to the machines by flexible hosing (made so as to stand double probable pressure), is always available for the full length of the retort-house, and, when applied to produce any of the various motions of the machines, causes the pistons, with the rake or scoop, &c., attached to them, to work with such a rapid, smooth, and "sweet" motion, it is quite clear the power required and wear and tear are reduced to a minimum. The great simplicity of the machines and ease of working them may be gathered from the fact that in less than ten minutes after first seeing the machines, Mr. Foulis posted me behind one, in the youth's place who was controlling it, and I was at once able to discharge the retorts as readily as he did. The charging of the retorts is just as simple. It is surprising how simply so many different motions are obtained, two or three small pistons, to each of which a four-way cock is attached (completely under the control of the youth working it, and from one position), being all that is needful to move either machine backward or forward, to send the rake or scoop into or out of the retort, to lift the charge of coal into the scoop, and complete the operation.

At the large new Glasgow Gas-Works at Maryhill, where I saw the machines in operation, Mr. Foulis has ingeniously applied hydraulic power to perform many operations generally accomplished by manual or steam power, such as raising the purifier-lids, working the hoists that convey the materials to floor, forming roof of the large open purifying shed, coal lifts, &c., at less expense and with much greater convenience than steam power can be applied, and is thoroughly satisfied with the result.

A small engine does all the pumping to produce the power that is necessary for these purposes, which is distributed by means of pipes, and is available at *all times* at *any spot* desired.

The cost of water is very trifling, as it is all conveyed back in drains into the pumping-well, to be used again. The machines cannot be expensive, from the fact of their simplicity and lightness, and that there is nothing costly about them—points which, when taken into consideration with the efficiency of their operations, are sure to expedite their

general adoption in other gas-works, and so increase the admiration with which practical men will view an invention which accomplishes so much in so simple a manner.

I believe Mr. Foulis is quite convinced, from actual working results, that the cost of stoking by these machines will not exceed one-half that by manual labour. I am sure he is to be congratulated upon the results of his labours in this direction, and that, whilst conferring so great a boon upon those engaged in this industry, he has placed his ideas beyond the region of theory or supposition, and put them in the clear daylight of fact.

10, *Mark Lane, E.C., March* 14, 1874. JAMES T. M'DOUGALL.

Parliamentary Intelligence.

GAS AND WATER BILLS FOR 1874.

The House of Commons Examiners of Petitions for Private Bills on Standing Orders Proofs resumed their sittings on the 9th inst., when the Standing Orders were declared to be complied with in the cases of the Edinburgh and District Water, Dublin Corporation Water, and Dublin Corporation Gas Bills.

Legal Intelligence.

COURT OF CHANCERY.

TUESDAY, MARCH 10.

(*Before the* LORDS JUSTICES OF APPEAL.)

THE WILTS AND BERKS CANAL NAVIGATION COMPANY *v.* THE SWINDON WATER-WORKS COMPANY, LIMITED.

Mr. PEARSON, Q.C., and Mr. C. M. ROUPELL appeared for the plaintiffs; Mr. GLASSE, Q.C., and Mr. BRISTOWE, Q.C. (with whom was Mr. W. W. KARSLAKE), on behalf of the defendants, supported the decree of the Vice-Chancellor.

This was an appeal from a decision of Vice-Chancellor Malins. The suit was instituted in January, 1871, by the company of proprietors of the Wilts and Berks Canal, which is 52 miles in length, and extends from Semington, in the county of Wilts, to Abingdon, in Berkshire, in order to prevent the Swindon Water-Works Company from diverting into a reservoir, which they have constructed near the village of Wroughton, in the county of Wilts, the water flowing from a cluster of springs near that village, called the "Seven Springs," which water would, but for such diversion, flow through a culvert along the western side of the reservoir into a stream called the Wroughton stream, and so down into the plaintiffs canal.

The plaintiffs rested their case upon an Act of Parliament passed in the year 1821 (1 and 2 George IV., cap. 9), which, after reciting and repealing six Acts of George III., under which the system of canals and cuts now forming the Wilts and Berks Canal was constructed, consolidated those canals and cuts into one common concern, vested the whole property in the plaintiffs company, and empowered them to maintain and keep the united canal navigable for boats, barges, and other vessels, and for that purpose to supply it for ever thereafter with water from all rivers, springs, brooks, streams, and watercourses which had been or should be found within 2000 yards from any part of their canal, or any reservoirs belonging thereto; and to deepen, widen, enlarge, or strengthen any watercourses brought into the same, and to make reservoirs to supply their canal with water. This Act, the plaintiffs insisted, gave them the right to take for their canal water from all defined channels within 2000 yards of their canal; and having, in the year 1807, altered the course of the Wroughton stream so as to make it flow into their canal, they complained that the defendants, who were formed in the year 1866 as a limited company for supplying the towns of Old and New Swindon with water, had not only, by converting a valley near Wroughton into a reservoir, appropriated water to which the plaintiffs were entitled, but had also diverted the Wroughton stream into their reservoir.

The defendants case was that the plaintiffs were only entitled to so much water as was required for the purpose of the navigation of their canal, and that, as the water of the Wroughton stream was not wanted by the plaintiffs for the legitimate purpose of their canal, they were entitled to divert it for the purpose of supplying the inhabitants of the district with water. They further alleged that the canal company had more water than they were entitled to, for they had actually for many years been selling water from their canal to the Great Western Railway Company, and had offered it for sale to the railway company in November, 1870, when the diversion complained of was effected.

The Vice-Chancellor dismissed the bill, with costs, and the plaintiffs appealed.

Lord Justice JAMES, in delivering judgment, said he was of opinion that the plaintiffs were in the right. They were asserting by their bill a legal right. Under the powers of their Act they, many years ago, diverted the water of the Wroughton stream by means of a new channel into their canal, and that new channel had been the lawful channel of the stream ever since. The plaintiffs had all the rights of riparian proprietors with respect to that stream, and among those rights was the right to prevent any other riparian proprietor higher up the stream from diverting the stream so as to cause it to flow in any other than its natural channel. The water in a stream was for the ordinary use of all the riparian proprietors. The defendants were a water company, who were minded, partly from public motives and partly from motives of private profit, to supply water to the large towns of Old and New Swindon. That was not a purpose for which a riparian proprietor was entitled to divert the water of a stream from its ordinary channel. This was the question of right which the court was called upon to decide. To sustain an action at law in such a case it would be enough to show that what was being done by the defendants would, if allowed to go on, destroy the plaintiffs right to use the water when they wanted it. A jury would be directed to find for the plaintiffs, though the actual damage might be only 1s. In this case the evidence showed that there was actual damage in the autumn of 1870; the water in the canal was reduced 3 feet or 4 feet. That would be a very serious damage to a canal. By their answer the defendants claimed a right to divert the water of the Wroughton stream whenever they wanted it. This made it absolutely necessary for the court to determine the right, and the decree of the Vice-Chancellor amounted to a determination in favour of the defendants. The plaintiffs were entitled to a declaration that the defendants had no right to divert the water in this way. But, inasmuch as a canal company could only legally take water for the purposes of their navigation (though, if they happened to have a surplus, they might, perhaps, sell it), an injunction ought not to be granted in such a form as would enable the plaintiffs to play the part of the dog in the manger, and to prevent the defendants from using the water of the Wroughton stream at times when the plaintiffs would be letting it run to waste. Therefore, while making the general declaration of right in the plaintiffs favour, the injunction would only go to restrain them from diverting the water so as to cause any injury to the navigation of the canal. The plaintiffs must have the costs of the suit.

Lord Justice MELLISH was of the same opinion. The canal company having purchased land on the banks of the stream, had the ordinary rights of a riparian proprietor. And, besides these rights, they had a right to take the water of the stream to supply their canal for the purposes of navigation. They had no right to take water for other purposes, as, for instance, for the purpose of selling it. If they did so, probably any proprietor lower down the stream could sustain an action against them. If, however, they took the water for the purposes of their canal, and then they happened to have a surplus in any particular pound, probably they would be entitled to sell it. This suit was brought by the plaintiffs in defence of their rights as canal owners. The only real argument against it was that at the time the suit was brought the plaintiffs did not want the water. There had, however, in fact, in November, 1870, been a diversion of the water at a time when the plaintiffs did want it. But, in his lordship's opinion, the proposition was not correct that an action at law could have been sustained only if the plaintiffs had at the time when it was brought actually wanted the water. The real test was this: Would the person who diverted the water acquire a right to do so if he went on for 20 years? He certainly would. His lordship agreed that the plaintiffs Act did not give them the whole right to the Wroughton stream. It did not deprive the riparian proprietors higher up of their ordinary rights, and if the population increased, and the exercise of those ordinary rights deprived the canal company of water, there would be no remedy. But if the proprietors above took the water for purposes for which they were not entitled to take it, the canal company had the same remedies as any other riparian proprietor would have. His lordship agreed that the injunction ought to be restricted in the way already mentioned.

FRIDAY, MARCH 6.

(*Before Vice-Chancellor* MALINS.)

In re THE WETHERBY GAS COMPANY.

In this case a petition had been presented to wind up the company under the order of the court. The petitioner was James Houlton, of Wetherby, in the West Riding of Yorkshire, chemist and druggist, and one of the directors of the company. On the 11th of December, 1845, the company was incorporated and duly registered under the Joint-Stock Company's Registration Acts then in force. Its affairs were regulated by a deed of settlement, which authorized the directors to borrow upon bond or the security of the works sums not exceeding £500. They were also precluded from contracting any debts or liabilities on behalf of the company beyond £500, except for the original erection of the works. Power was, however, reserved by the deed of settlement to an extraordinary general meeting of the company to vary or alter its articles. A piece of land was duly acquired by the company, on which a gasometer and other works were erected, and where they continued to carry on their business. On the 9th of November, 1869, an extraordinary general meeting of the company was held, at which it was resolved to repeal clauses 55, 56, 57, and 58 of the deed of settlement. Resolutions were also passed giving the directors power to accept and endorse bills of exchange on behalf of the company up to the amount of £1500. The company had been registered under the Companies Acts, passed subsequently to its incorporation. On the 18th of November, 1869, the petitioner, in conjunction with two other of the directors, John Smith and Richard Daniel, obtained a loan of £300 from the Knaresborough and Claro Banking Company, for which they signed and gave a promissory note on behalf of the company. Portions of this were paid off from time to time, but when £115 was still due the bank threatened proceedings, to avoid which the petitioner paid off the amount. It was alleged by the petitioner that John Smith had for some time been, and now was, sole manager of the company, and received all moneys on their behalf. He had applied to him for repayment of £115, but had been unable to obtain it. The company also owed £1000 to a Miss Elsworth, and, it was said, were indebted to other persons in large sums. It was alleged that all the shares in the company were paid up, and that the only property available for payment of its debts was the land and gas-works thereon. A winding-up order, under the direction of the court, was therefore prayed.

The Vice-Chancellor made the order.

ROLLS COURT.

(*Before the* MASTER OF THE ROLLS.)

THE LATE GAS EXPLOSION AT HALIFAX.

COMMERCIAL UNION FIRE INSURANCE COMPANY *v.* LISTER.

In this case it will be remembered that the Commercial Insurance Company and others, as plaintiffs, applied for an injunction to restrain Mr. S. C. Lister from compromising, without their permission, an action against the Corporation of Halifax, for loss by the destruction by fire of Mr. Lister's factory at Halifax, such fire being caused by the negligence of the corporation's workmen; and that it was agreed that the plaintiffs should have the control of the action on paying to Mr. Lister the sum which he considered himself entitled to recover from the corporation.

Mr. SOUTHGATE appeared for the plaintiffs, and Mr. FRY on behalf of the defendant.

After some discussion,

The MASTER OF THE ROLLS delivered judgment. He said: The point in this case is really a very simple one. A man insures his mill against fire with an insurance company—in this case, with a great many insurance companies. The total amount of the loss is admitted to exceed very largely the total amount of the insurance. It is alleged that the fire was caused, not by any act of the person assured, but by the act of the Corporation of Halifax or their servants, whose carelessness is alleged to have been the origin of the fire. And the carelessness was of such a kind as to render the corporation liable for the whole of the loss. In that state of affairs, the insurance company or companies is or are willing to pay the amount of the insurance, and they say, having paid that amount—they pay, of course, by way of indemnity—if the assured obtains from the Corporation of Halifax a sum larger than the difference between the amount of the insurance and the amount of the loss, he is a trustee for that excess for the insurance company or companies—a proposition which I take to be indisputable. But then they want to go further, and they want to say that the assured, in such a case as that, being entitled to bring an action for the loss he has sustained, is not entitled to be master of that action; and bringing it *bonâ fide* and acting *bonâ fide*, they say he is not entitled to compromise that action, or to do anything else without their assent. I can find no ground whatever for such a suggestion. He is entitled to bring an action against the corporation for injury to himself. He is entitled, and he must, and has agreed, as there is one cause of action, to bring the action for the whole loss to himself, including that part of the loss against which he is indemnified by the insurance companies. He is not entitled to compromise that action otherwise than *bonâ fide*. He professes his willingness now, at all events, that if he does compromise it, he will act in a *bonâ fide* manner. Another objection was taken on a small point—that he was a ratepayer of Halifax—the town which would be ultimately liable to make good the loss if the action results adversely to the corporation, and that he would have regard to that fact in making the compromise. It is sufficient for me to say now that he is willing to undertake not to have regard to that fact; and, therefore, it is not necessary to discuss the question as to how far that compromise would be *bonâ fide*, even if he had regard to that. Then, that being so, it appears to me it would not be right, on these undertakings being given, to make any order on this motion. Following a rule laid down by Vice-Chancellor Kindersley, that on an interlocutory application the court ought not to intimate, further than is absolutely necessary to decide upon the application to the court, the opinion of the judge on the merits of the question, I abstain from saying anything more. Upon that undertaking being given, I think there should be no further order, and that the costs of this motion should be costs in the cause.

CHELMSFORD SPRING ASSIZES.—Monday, March 9.

(Nisi Prius Court.—Before Justice Lush *and a Special Jury.)*

THE ROMFORD LOCAL BOARD OF HEALTH *v.* HOPE.—HOPE *v.* THE ROMFORD LOCAL BOARD OF HEALTH.

Mr. Hawkins, Q.C., Mr. Prentice, Q.C., and Mr. C. D. Hall appeared for the local board; Mr. Murphy, Q.C., and Mr. T. Atkinson appeared for Mr. Hope.

These were cross actions, arising out of the letting of a sewage farm at Romford, by the local board of that town, to Mr W. Hope. In the first action, the local board sought to recover from the defendant the sum of £600, being the amount of a year's rent, due under a lease dated the 16th of May, 1870, of a farm called Britton's farm, in the parish of Hornchurch, which farm had been purchased by them for the purpose of utilizing thereon the sewage of Romford. The rent of the farm itself was £313 10s. per annum, and a further sum of £600 a year was reserved, either by way of rental or as an annual charge or payment for the sewage of the town, which was allowed to flow on to it. This latter sum the defendant refused to pay on several grounds. There was first a formal plea, denying that the deed or lease had been entered into by the defendant; second, that no part of the rent was due at the time the action was commenced; third, that the plaintiffs had, without his consent and against his will, wrongfully abstracted and converted to their own use a large portion of the sewage of Romford; and fourth, that defendant had been induced to make and execute the lease through the fraud and misrepresentation of the plaintiffs as to the amount of the sewage to be placed at his disposal.

Mr. Hawkins opened the case in a long and humorous speech, in the course of which he narrated the circumstances under which the agreement between the parties had been come to. It appeared that, previous to 1868, the sewage of so much of Romford as is sewered was conveyed into tanks just outside the town, and from thence was discharged, in a more or less purified state, into the stream or river Rom. The inhabitants dwelling near the spot, and those through whose land the sewage flowed, complained of the nuisance occasioned to them, and proceedings were taken in Chancery to obtain a remedy. An injunction against the local board having been obtained, it was resolved by that body to procure a farm for the purpose of utilizing the sewage. The farm which they purchased, and which is the property in question in this suit, is situated two miles and a half from the town, and contains about 120 acres, for which the board paid the sum of £10,000. Upon this estate they erected, at the cost of a further sum of £10,000, certain works and apparatus, and they laid down pipes for the conveyance of the sewage from the tanks at Romford to the farm. As a corporate body, the local board could not carry on farming operations, and they accordingly advertised for a tenant to take the farm and works on lease. In their advertisement they stated, what, on the census returns, they felt justified in stating, that the population of Romford amounted to 6000 persons. But, although there were 6000 inhabitants in Romford, the houses in which they resided were not all of them connected with the sewers—some had cesspools, and some were drained otherwise than into the outfall sewer. The advertisement was as follows:—

"*To Scientific Agriculturists.*—The Romford Local Board of Health are desirous to receive tenders from persons wishing to hire 120 acres of light land, or thereabouts, recently purchased for the reception of the sewage of the town of Romford, which town contains a large and increasing brewery and about 6000 inhabitants. The sewage will be pumped on to the farm by the local board, and the lessee will be bound to receive the whole of such sewage, and use the same for the purpose of irrigation. There is a first-rate residence, with suitable buildings, and a large garden enclosed with brick walls."

The defendant replied to the advertisement, and negotiations were entered into for his taking the farm. Certain proposals were made for alterations and additions to the buildings, &c., upon the outlay for which Mr. Hope agreed to pay 6½ per cent. interest. He required also that the local board should guarantee to him the sewage of 6000 persons of all ages, and that they should undertake to discharge it at the rate of not less than 20 gallons per head per day. This the board objected to do, and these latter conditions were struck out of the agreement. After a great deal of discussion the matter was arranged and the lease prepared, Mr. Hope being distinctly told that the whole of the sewage of the place was not discharged into the main sewer. The lease contained a proviso that if any dispute arose between the parties it should be referred to the arbitration of two indifferent persons, one to be chosen on each side.

Justice Lush asked whether any application had been made on either side to enforce that clause. The parties agreed beforehand that all disputes should be referred to arbitration, and this seemed to him to be one of the very matters contemplated when the clause was introduced into the lease.

Mr. Hawkins said it was his individual opinion that there should be an arbitration, but his opinion had been overruled. He believed it would be impossible for the jury to form a satisfactory judgment on the questions in dispute. There were questions as to the mode in which the farm was cultivated, and as to the way in which the sewage was distributed on to it, and as to the crops that were grown, &c., which it would be impossible to decide without seeing the farm.

Mr. Murphy said he regretted that the plea of fraud had been entered, as it could not be relied upon, the contract not being disavowed. As to the suggestion from the court, he thought, looking at the clause in the lease, that the matters in dispute could be more satisfactorily settled by an arbitrator as soon as the question of law was settled. The question was whether, in his cross action, he could not sustain the fact that a statement had been made by the other side—he would not say falsely, but made without due regard to the materials they had at hand for coming to a decision. It occurred to him that if these matters were disposed of there would be no opposition to consulting some surveyor of eminence on the question of damages.

Justice Lush said it was clearly useless to think of trying the case.

Mr. Murphy said his client had put the matter entirely in his hands, and would do whatever he (Mr. Murphy) thought right. There were two sides to this, as to every other question, and Mr. Hawkins would allow him to say that if the cases had been tried Mr. Hope believed he would be able to show that he was quite justified in refusing to pay this claim until his claim against the local board had been adjudicated upon.

After some further conversation, it was agreed that both cases should be referred on the following terms:—"Verdict for the plaintiff in each action for damages in the declaration, subject to special case in both actions, to be settled by Mr. T. M. White. In event of judgment for plaintiffs in the first action, judgment to be for such sum as the court may direct. In event of judgment for plaintiff in cross action, damages to be assessed by two arbitrators, one appointed by each party, and if they cannot agree, by an umpire to be appointed by them, it being desirable to have one special case only; the parties agree that if it can be done by order of a judge or by amendment of present writ, by making it an Exchequer writ, and by issuing a new one from the Exchequer or otherwise, one special case in the Exchequer shall be stated so as to raise all questions involved in both actions. All other usual terms. Costs of special juries to be costs in causes. If any difference arise in drawing up or carrying out these terms, such difference to be determined by Mr. Hawkins and Mr. Murphy, or, if they differ, by Mr. Justice Lush. No execution in either action until judgment in both and damages, if assessed. Parties to go before arbitrators forthwith, without drawing case. The plea of fraud in first action to be withdrawn."

HAMMERSMITH POLICE COURT.—Friday, March 13.

(Before Mr. Ingham.)

VESTRY OF KENSINGTON *v.* THE GASLIGHT AND COKE COMPANY.

This was a summons taken out by the vestry of Kensington against the Chartered Gas Company, for unlawfully discharging certain soil or filth into the Counter's Creek sewer from their works at Kensal Green.

Mr. Harding, clerk to the vestry, who attended to support the application, said the summons was taken out under the 205th section of the Metropolis Local Management Act, and the vestry complained of the company discharging certain refuse from their private drains into the public sewer. The filth extended through the stream for a distance of two or three miles, to the discomfort of the inhabitants. The vestry had received a memorial, numerously signed, principally by the inhabitants of a poor district through which the river passed, asking for their interference.

Mr. *Langham*, the sanitary inspector of Notting Hill, produced samples of the liquid taken at various times from the drains; Mr. *James Broadbridge*, surveyor of the vestry, pointed out on the plans the connexions with the drains and the public sewer; and Dr. *Dudfield*, the medical officer of health, stated that he had detected from two gulley-holes the smell of gas similar to the smell in the bottles.

Mr. Besley, who appeared for the company, said there was formerly an underground tank on the works to receive the ammoniacal liquid. By an accident there was an escape of gas, which exploded and blew up the tank, causing the liquid to be spread over the land. The company was not aware of any escape into the river until the vestry called their attention to it. He denied that the refuse of the works passed into the sewers, and said if it did there would be a loss to the company. They were anxious to do everything in their power to satisfy the vestry, and were now having works constructed to prevent a recurrence of the complaint. He asked for an adjournment for three months for the completion of the work.

Mr. Harding objected, because the inhabitants would have to suffer from the annoyance all the time.

Mr. Besley pointed out the words in the section, which he contended did not apply to a liquid. He said it was not intended to make sewers so pleasant that ladies and gentlemen could pass through them, as they heard was done in Paris. He claimed for the company the right to pour into the sewer all their liquid matter which would not obstruct it.

Mr. Ingham said it was only a question of time, as the company were doing all that was necessary. Three months did appear a long time. He would have consented to a month's adjournment.

Mr. Harding said the vestry would bow to the magistrate's decision, but the responsibility of the adjournment would rest upon him.

Mr. Ingham said he would undertake the responsibility. He thought the adjournment would be the best arrangement. He was impressed with the construction which Mr. Besley had put on the section, and if he fined the company £5 he should grant him a case, which would delay the matter for a longer period.

Ultimately the summons was adjourned until the 30th of April.

Miscellaneous News.

IMPERIAL GAS ACT, 1869.

Board of Trade Commission.—Award of the Commissioners.

On the 10th inst., the Commissioners issued the following award:—

"In the Matter of the Imperial Gas Act, 1869.

"*The Certificate of the Commissioners appointed by the Board of Trade on an Application of the Imperial Gaslight and Coke Company for a Revision of the Scale of Illuminating Power and Price of Gas for the Year* 1874.

"Whereas the Board of Trade, by minute dated the 13th day of January, 1874, by virtue of the authority conferred on them by the Imperial Gas Act, 1869, did appoint us, the undersigned, to be commissioners for the purpose of revising the scale of illuminating power and price of the gas supplied by the Imperial Gaslight and Coke Company for the current year:

"And whereas we have heard the Imperial Gaslight and Coke Company and the Metropolitan Board of Works, by their respective counsel, agents, and witnesses:

"And whereas the Imperial Gas Act, 1869, enacts (section 35) as follows:—

"In fixing the illuminating power and price for any year, the commissioners shall observe the following rules:—

"1. They shall fix such an illuminating power and such a price as shall be calculated to yield to the company with due care and management a dividend in that year (after allowing for the excess or surplus (if any) carried in the then last preceding year to the credit of the divisible profit, and to the reserved fund of the company) attaining as near as may be, but in no case exceeding, the rates of dividend to which the respective capitals of the company are entitled under this Act and the existing Acts of the company, and to make up the reserved fund and contingency-fund of the company;

"2. They shall not fix in any case an illuminating power lower or a price higher than the minimum of illuminating power and maximum of price prescribed by the Act of 1860;

"3. Subject to the foregoing provisions, they shall fix the illuminating power as high, and the price as low, as circumstances admit:

"Now we hereby certify that by virtue and in exercise of the authority vested in us under the Imperial Gas Act, 1869, and in accordance with the terms thereof, we have fixed and we do hereby fix the illuminating power and the price of gas for the Imperial Gaslight and Coke Company to take effect as on and from the 1st day of January, 1874, and for the year 1874, as follows (that is to say):—

"1. The gas supplied by the Imperial Gaslight and Coke Company shall be of an illuminating power of not less than 14 candles.

"2. The maximum price chargeable by the Imperial Gaslight and Coke Company for this gas shall be at the rate of 4s. 8d. per 1000 cubic feet.

"Francis S. Reilly.
"W. Odling.
"*Dated this 10th day of March*, 1874." "W. P. Pattison.

The issue of the above certificate was accompanied by a "memorandum," in which the commissioners declare the reasons by which they were guided in arriving at their decison. The circumstances of the inquiry, and the powers under which the commissioners acted, are set forth in clauses 1 to 4, after which the document proceeds as follows:—

"In February, 1874, we heard the company and the Metropolitan Board of Works by their respective counsel, agents, and witnesses.

"Neither party proposed an alteration of illuminating power.

"We have by our certificate of this date fixed for the company for 1874 the illuminating power and price of common gas at 14 candles, and at 4s. 8d. per 1000 cubic feet.

"In the discussions before us questions were raised respecting (among other things) the construction of section 35 of the Act of 1869, as regards due care and management, and as regards the reserve-fund. Availing ourselves of the provision in the Act (section 32) authorizing us to obtain such legal and other advice and assistance as we might think fit, we have obtained the advice of the law officers of the Crown on these questions. The following case, with the Acts relating to the company, was submitted to them (in consultation with Mr. E. Round) on our behalf, and the opinion thereon is subjoined to the case:—

"*Case.*

"*The Imperial Gaslight and Coke Company.*

"The Imperial Gaslight and Coke Company are one of the companies supplying gas in the metropolis.

"The company were incorporated in 1821, but by an Act of 1854 their former Acts were repealed and consolidated, and the company were reincorporated.

"In 1866 the company obtained a further money Act.

"In 1869 a further works and money Act was obtained by the company.

"This Act, among other things, authorizes the company to raise further share capital (sections 7 to 10). and to raise further loan capital (sections 11 to 13, and 15 and 16). Section 17 relates to the application of the new capital.

"Sections 18 to 20 relate to two funds, called the contingency-fund and the reserve-fund. The reserve-fund was created under section 31 of the Gas-Works Clauses Act, 1847.

"Sections 21 to 24 relate to illuminating power and price.

"Sections 25 to 36 (on which the present questions arise) provide an arrangement for revision of power and price by the machinery of a body of commissioners appointed by the Board of Trade.

"Section 34 relates to the time for the hearing and decision by the commissioners.

"Section 35 relates to the rules to be observed by the commissioners in fixing power and price.

"In the present year, for the first time, commissioners have been appointed on the application of the company. The commissioners are Mr. Reilly, barrister-at-law; Dr. Odling, F.R.S., professor of chemistry at Oxford; and Mr. Pattison, actuary.

"Questions have been raised in the discussions before the commissioners respecting the effect of the words, with 'due care' and management, in section 35.

"It has been suggested on behalf of the Metropolitan Board of Works, representing the consumers, that the company have raised capital in such a manner as to impose a greater burden than necessary on the consumers, and that Parliament did not intend that their powers of raising capital should be used otherwise than with discretion and a view to economy in all that affects the charge for gas. It is said, first, that the sum of £650,000, raised under the Act of 1869 before the end of the year 1872, might have been raised on 5 per cent. shares, with or even without the option of conversion into 7 per cent. shares at the end of five years, when the works authorized by the Act of 1869 would become productive. In fact, this capital was raised by 7 per cent. shares. Consequently, in respect of this amount, the Metropolitan Board of Works suggest that 2 per cent. should be deducted in the calculation of the amount required for dividend in 1874. It is said, secondly, that the company, having raised a sum of £260,000 on loan at 4½ per cent., converted that sum in 1866 into share capital at 7 per cent., and annihilated their borrowing powers to that extent, thus increasing the burden to the consumers, without any corresponding advantage to them, which course, if then legitimate, could be adopted now as to the company's outstanding mortgage debt of £416,760, to the extent of £204,335, their balance of unissued share capital.

"It has also been suggested on behalf of the Metropolitan Board of Works that the outlay on new works has been excessive in proportion to the results hitherto obtained.

"On the other hand, it has been contended on behalf of the company, in effect, that it would be *ultra vires* for the commissioners to have regard to such points as these as affecting the question of due care and management, and that the consideration of due care and management applies only to the earning of profit, and has nothing to do with the raising or the expenditure of capital in past years.

"The importance of these questions appears from the consideration that the company's gas-rental for 1873 was £594,262 from private consumers, and that they endeavour to show a title to an increase of £191,043 for 1874, amounting to 30 per cent. Matters affecting this increase, irrespective of due care and management in the raising and expenditure of capital, are comparatively unimportant.

"A further question has been raised with respect to the capital on which dividend for 1874 is to be calculated. The company have contended that all capital is to be taken into account which was paid up at the end of 1873. The Metropolitan Board of Works, on the contrary, contend that the commissioners, in fixing the price, should not calculate dividend on a large sum of capital which was called and paid up in December, 1873, the same being intact in the balance, and therefore to be taken as not raised, and the amount of unexpended capital being at the end of 1873 considerably larger than at the end of any previous year, and therefore in excess of the requirements of the company for floating or working capital.

"Another question that has been raised relates to the reserved fund. The commissioners are directed to fix a price calculated not only to yield a dividend, but also to make up the reserved fund and contingency fund of the company. The contingency fund is full. The reserved fund (the maximum of which is £81,250) was drawn upon for dividend last year, and the amount required to fill it up is £53,000.

"The commissioners heard the company and the Metropolitan Board of Works before and on the 28th of February, when the hearing ended.

"Counsel are requested to advise the commissioners on the following questions:—

"1. Whether, on the true construction of the Act, the consideration of due care and management includes an inquiry into the question of an injudicious or unduly burdensome mode of raising money in past years.

"2. Whether, on the true construction of the Act, the consideration of due care and management includes an inquiry into the question of injudicious or excessive expenditure of capital on works or otherwise in past years.

"3. If so, in what way ought the commissioners to apply to the year 1874 the conclusion of want of due care and management in either respect, in past years, if arrived at.

"4. Whether, on the true construction of the Act, the commissioners ought to calculate dividend for 1874 on the whole capital paid up at the end of 1873, without distinction as to part thereof being then unexpended and (as is alleged) not required as floating capital.

"5. Whether, on the true construction of the Act, the commissioners ought to fix a price for 1874 calculated to make up in that year the whole deficiency of the reserved fund.

"6. Is it obligatory on the commissioners to give their decision within ten days after Feb. 28; and, if they do not, could the company, or the Metropolitan Board of Works, or any consumer, afterwards raise any objection on that ground.

"*Opinion.*

"1—4. We think that, under the Imperial Gas Act, 1869, the commissioners are precluded from inquiring into the question as to the mode in which that company have raised or expended their capital, and that, in calculating the dividend for the year 1874, they should take into account the whole capital paid up to the end of 1873, which, for this purpose, must be assumed to have been duly raised.

"5. The price of gas to be fixed by the commissioners for the year 1874 should be such as to admit of the reserved fund being made up to the authorized amount of £81,250.

"6. We think it would not be safe for the commissioners to postpone giving their decision beyond the period of ten days after the conclusion of the hearing, as we think the statute is absolute, and not merely directory, in this respect.

"JOHN B. KARSLAKE.
"RICHARD BAGGALLAY.
"*Temple, March* 5, 1874. "EDMUND ROUND.

"On this opinion, confirming, as it does, our own interpretation, we have acted.

"The authorized share capital of the company is £2,860,000. The amount thereof paid up on the 31st of December, 1873, was £2,655,665.

"Of this capital a portion (£1,560,000) bears 10 per cent. dividend, amounting to	£156,000
The residue (£1,095,665) bears 7 per cent. dividend, amounting to	76,697
The amount required to fill up the reserve-fund to the maximum (£81,250) is	53,302
The interest on loan capital is	25,643
Making the total charge for share and loan capital in 1874	£311,642

"We have then estimated the net income for 1874. This we have done on the basis of 1873, after allowance for increase at the rate of 2½ per cent. in the sale of gas and residuals, and taking the probable expenditure at an amount arrived at by our investigation, but on the supposition of no increase in the price chargeable for gas by the company.

"From gross income thus estimated	£943,116
"Deducting estimated expenditure	801,633
"We find the balance to be	£141,483

"This balance is applicable towards meeting the total charge for share and loan capital in 1874.

"Then from the amount of that charge	£311,642
"Deducting this balance	141,483
"We find the difference to be	£170,159

"This sum of £170,159 is the estimated deficiency of income for 1874 which we are required by the Act to supplement by means of an increase in the price of gas.

"The quantity of gas to be sold in 1874, as estimated by us, is 3,614,370,000 cubic feet. If 11d. were added to the present price (3s. 9d.), making 4s. 8d., the additional produce would be £165,658.

"Therefore, leaving the illuminating power unaltered, we have fixed the maximum price at 4s. 8d., being a price which is in our judgment calculated to yield to the company, with due care and management, a dividend in 1874 attaining, as near as may be, but not exceeding, the rates of dividend to which the respective capitals of the company are entitled under the company's Acts, and to make up the reserved fund of the company, and not being higher than the maximum price prescribed by the Metropolis Gas Act, 1860—that is to say, 5s. 6d.

"This price of 4s. 8d. may be regarded as distributable thus—2s. 11½d. for cost of manufacture and distribution and general expenses, 17d. for charge for share and loan capital, and 3½d. for reserved fund.

"FRANCIS S. REILLY.
"W. ODLING.
"*March* 10, 1874." "W. P. PATTISON."

CITY OF LONDON GAS ACT, 1868.

BOARD OF TRADE COMMISSION.

Commissioners—F. S. REILLY, *Esq.*, *Chairman; Professor* ODLING, *F.R.S., and* W. P. PATTISON, *Esq.*

THURSDAY, MARCH 12, 1874.

The Commissioners commenced their sittings this morning in the Committee Room A, House of Lords, for the purpose of inquiring into the application of The Gaslight and Coke (Chartered) Gas Company to the Board of Trade for a revision of the price of gas for the current year.

Serjeant SARGOOD and Mr. WARD appeared as counsel for the company; Mr. CRIPPS, Q.C., and Mr. BIRON for the Metropolitan Board of Works; and Mr. PHILBRICK and Mr. GOLDNEY for the Corporation of the City of London.

Serjeant SARGOOD, in opening the case, gave a brief sketch of the history of the company, and called attention to the provisions of the City of London Gas Act, 1868, and the Company's Act, of that year, under which the present inquiry was instituted. In approaching the question of a revision of price for the third time, he said it was desirable to divest it of all needless argument, and to bear in mind certain points, which had already been discussed on both sides, respecting which they had the advantage of the decisions of the commissioners in the inquiry of last year relating to this company, and on the recent application of the Imperial Company. It might be taken as settled that the making up of the insurance-fund of the company was a matter not optional but obligatory upon the commissioners, and that it was not needful to discuss the amount of capital upon which the company were entitled to have their dividend made up. The dividend was payable upon the actual capital paid up and expended, and the insurance-fund was to be made up to the extent of 1 per cent. upon the capital paid up, whether expended or not. In the discussion upon the Imperial Company's application, two other questions were raised, which, by the memorandum of the commissioners just issued, appeared to have been settled—viz., that "due care and management" applied only to the question of earning profit, and did not affect, so far as the jurisdiction of the commissioners extended, the raising of capital and the mode of expending that capital. As this point was decided, he did not expect that his learned friends who represented the Metropolitan Board would raise it again; but whether the corporation, who were not concerned in, and might not consider themselves bound by the decision on the late inquiry, would do so he was not in a position to say. The Chartered Company came before the commission with an estimate as fairly framed as possible, showing what was likely to be the result of their industry in the current year; and, seeing that these earnings would not be sufficient for the exigencies of their case, they asked that their normal price for gas of 3s. 9d. might be supplemented by such an additional rate as would produce the sum required. They had founded their estimates upon the experience of 1873 as to quantities and probable amount of business, taking the results on the basis of 3s. 9d. per 1000 cubic feet, to which they would fall back in the event of no revision taking place. What views were entertained on the other side it was impossible to say, as neither the Metropolitan Board nor the corporation had made any communication on the subject, nor intimated what course they intended to take. The Metropolitan Board had, however, sent a number of interrogatories to the company, and those interrogatories had been fully answered. To some points in these he (Serjeant Sargood) would draw attention, leaving them to be more fully explained by the witnesses. The income of the company in 1873, as estimated for the purpose of the inquiry last year, was £148,000 less than the actual income, but of this sum £110,000 was due to the increase in price which the commissioners thought proper to allow. There was also a certain increase in the actual quantity of gas sold above that which was estimated. The company calculated upon selling the same quantity as in 1872, not expecting any increase. There really was an increase, however, of 4½ per cent., which gave another £30,000, and these two sums together nearly accounted for the whole difference. The commissioners

themselves estimated that there would be an increase of 7 per cent.—a rate which had, therefore, not been realized. The next material difference was that the coke produced last year £33,000 more than the company's estimate, arising from the fact that after the inquiry the value of that product became exceptionally high. On the expenditure side coals cost £5000 more than estimated, but that arose from the larger quantity used. The cost of purifying was nearly £4000 above the estimate. The commissioners, in their memorandum, said that in making their calculations they allowed £2634 for the additional expense of purification, and no doubt they considered that was a fair sum to allow, but the result proved that it was not enough.

Dr. ODLING said it was exactly what was asked for—6d. a ton on all the coal carbonized.

Serjeant SARGOOD had no doubt it was so, but it only showed that the company under-estimated some of their expenditure. The next material increase was in repairs and maintenance, which exceeded the estimate by £7855. The commissioners deducted £5000 from the company's estimate, but even had they not done so, there would have been a deficiency of nearly £3000. In the item of meter repairs and renewing, the excess of expenditure over the estimate was £7000 odd, arising from the necessity of a careful inspection into the state of the meters being undertaken, the effect of which, in the course of three years, would be that the whole of them would be put in a condition of thorough repair, after which period, the annual expenditure on this head would be much less than at present. This was only an effort at fair dealing as between the company and their consumers, which no one could complain of. There was a large increase in the rents, rates, and taxes, the assessments being heavier in the past year to the extent of £1000, and there having been an arrear of land-tax to pay, which had been in abeyance, through a dispute as to the company's liability, for some time. The collectors commissions were heavier, but as that was a sign of prosperity, nothing arose upon that; and there was a trifling addition of £1700 on the superannuations and allowances. On the other hand there were some items in which the expenditure was less, the first of which was the item of manufacturing wages; but here the difference was apparent rather than real; because, to a large extent, the difference between the estimated £106,000 and the actual cost (£86,120) came into account in another form—viz., in connexion with the residual products. The item of salaries was a trifle less, but not sufficient to make any appreciable difference in price. The large proportion of additional cost for repairs and maintenance was incurred at the Kensal Green works, which, when taken to by the company from the defunct Western Company, were in a very bad state and condition. The commissioners, in their award last year, intended to give the company their full statutory dividends, and also the per centage on their capital to which they were entitled on account of their insurance-fund. Their intention had, however, been frustrated to this extent, that, though the company had paid their dividends, they had been able to put nothing to the insurance-fund. Without attempting to reproach the commissioners in this matter, he ventured to hope they would bear this fact in mind, so that the company might not suffer from a disappointment of this kind again at the end of the present year. (The learned counsel proceeded to deal with the estimates for the current year, and to show how they had been prepared. These will be clearly understood from the annexed statement, which accompanied the application to the Board of Trade, and the details subsequently given in the evidence of the first witness.)

Statement showing the Sum required in the year 1874 for the Payment of the Authorized Dividends on the Capital of the Company and for Insurance-Fund.

The share capital of the company actually paid up and expended on Dec. 31, 1873, was					£3,149,804
Ordinary A shares	£1,799,978	entitled to	10	per cent. dividend, amounting to.	£180,000
„ B „	100,000	„	4	„ „	4,000
„ C „	200,000	„	10	„ „	20,000
„ D „	300,000	„	10	„ „	30,000
5 per cent. preference	749,826	„	5	„ „	37,500
	£3,149,804	Amount required for dividend . .			£271,500
The insurance-fund was authorized by the City of London Gas Act, 1868, incorporated with the company's Act of 1868, and limited to 1 per cent., in any one year, upon the paid-up share capital of the company. The amount of the paid-up share capital of the company on Dec. 31, 1873, was as above, £3,149,804; 1 per cent. on this amount					31,500
Total sum required in 1874 to pay dividends on above, and to make up the insurance-fund					£303,000

Statement showing the Estimated Net Income for 1874.

Estimated gross income as per answer to Metropolitan Board of Works question, No. 9		£1,074,252
Estimated gross expenditure, as per answer to Metropolitan Board of Works question, No. 9.		1,025,000
Estimated net income		£49,252
Out of this sum will have to be paid—		
For interest on £613,500 loan capital	£28,400	
„ „ debenture stock	7,500	35,900
Leaving as applicable to dividend and insurance-fund . .		13,352
Estimated deficit for the year 1874		£289,648

The company ask that the price of gas may be increased during the year 1874, by such a sum per 1000 cubic feet, as will meet this estimated deficiency.

Memorandum.—The sale of gas in 1874 is estimated at 3,225,000,000 cubic feet of common gas, and 767,000,000 cubic feet of cannel gas, making a total of 3,992,000,000 cubic feet.

To meet this deficiency of £289,648, the company asked the commissioners to give them an addition of 1s. 4½d. per 1000 to the price of their common gas, and 1s. 8d. to the price of their cannel gas. These additions would work out a total of £285,630 on the estimated consumption, which was about £4000 less than the amount required to be provided.

Mr. CRIPPS said it might be convenient to mention now, that which probably the commissioners would anticipate he would say. Those whom he represented had seen the legal opinion which had been given in the case of the Imperial Company with regard to the question of capital, and they had no alternative, for the purposes of this inquiry, than to accept it as law. He did not express a desire to reserve any step which his clients might think fit to take; and assuming that the commissioners would feel bound by the opinion they had received, and would decline to go into any question of the expenditure of capital, he would not attempt, either by direct evidence or in the way of cross-examination, to deal with that matter.

The CHAIRMAN wished it to be understood that the commissioners had acted on their own opinion; but they had taken advice, by way of assistance, as the Act authorized them.

Mr. PHILBRICK said the corporation of the City of London were no parties to the Imperial case, and therefore, in one sense, were not bound by the decision at which the commissioners had arrived. It would not be respectful to assume that the commissioners would in this case act differently, but the corporation desired to avoid being supposed to acquiesce in the construction put upon the Act, and they asked that the commissioners, in arriving at their conclusions, would append a note in their memorandum to the effect that they acted on the principle they had laid down in the other case. The corporation reserved to themselves the right of placing that construction before any other tribunal which might hereafter have to deal with the matter.

The CHAIRMAN said the commissioners were not under obligations to give any reason.

Mr. PHILBRICK said he was aware of that, but he assumed that the commissioners would adopt the same course in this as in the two former inquiries.

Mr. CRIPPS said he was quite content that it should be known that the inquiry proceeded on the supposition that the commissioners were precluded from inquiring into capital.

Serjeant SARGOOD said he would not have the supposition. Let the learned counsel make the attempt to go into the question, he (Serjeant Sargood) would then object, and the commissioners would decide what course they would take. It would then appear as their voluntary act; but he objected that everybody on one side of the table should be silent, in order that the commissioners might be asked to volunteer a statement upon a question which never appeared to have been raised. If his friends thought they could go elsewhere about it, let them take a grievance of their own creation.

Mr. CRIPPS said he had seen the memorandum of the commissioners in the Imperial case, and he did not know how they could go farther than that.

Serjeant SARGOOD said if his friend did not attempt to raise the question here, the commissioners had a right to suppose that the question was incapable of being raised. There was no *constat* that because the opponents attacked the capital question in the Imperial case that they were going to do the same in this. It might be so unexceptionable that they could not think of doing it. He believed it was unexceptionable; therefore let there not be an imported grievance into this case that did not exist. If the opponents of the company wished to impeach the administration of the capital, let them say so; and the commissioners might then say, "We will not hear you;" but the commissioners ought not to be asked to import the fact into their report without the opponents clearly stating that they desired it.

The CHAIRMAN said the commissioners would not feel it their duty to deal with any objections unless they were raised.

Mr. CRIPPS said he should not go through the farce of asking questions for the purpose of raising the point.

Mr. *J. W. Field*, examined by Mr. WARD.

I am the chief accountant of the Chartered Gas Company. The accounts of the company for 1873 to the 31st of December have been audited by the Government auditor. The amount of ordinary share capital on the 31st of December was £1,799,978, and the capital included in the preferential dividend, £1,349,826, making a total of £3,149,804. To pay dividend for the year 1874 on the ordinary and preference capital, we shall require £271,500. The insurance-fund is authorized by the City of London Gas Act, 1868, and is £31,500 for the current year, being 1 per cent. on the share capital. The interest on the loan and debenture capital amount to £35,900; the total of the three items being £338,900. The estimated increase of consumption of gas in 1874 has been based on that of 1873, allowing a normal increase on the supply of 1½ per cent. The amount sold in 1873 was 2,885,674,000, and adding 1½ per cent., makes it 2930 millions. We have transferred from the cannel gas 267 millions as the estimated quantity that will be converted into common on the 1st of July next. Assuming a considerable increase in the consumption, arising from the two facts of the lower illuminating power and the lower price, I have added 10 per cent., making a total of common gas of 3225 millions in the rough. The cannel gas last year was 1,022,652,000, from which I deduct the 267 millions for the transfer to the common gas, leaving 755,652,000, to which I add the 1½ per cent., which is 11,334,000, making a total of, in the gross, 767 millions, and a total of common and cannel for the year 1874 of 3992 millions. We have added to the actual consumption of the year 1872, 125 millions for the estimated consumption of gas lost during the strike in the December quarter of that year, and we arrive at that in this way: The September quarter consumption of 1872 increased over the corresponding quarter of 1871 by 4 per cent.; and the March quarter of 1873 increased over the March quarter of 1872 by between 5 and 6 per cent. The fair inference is that the December quarter of 1872 would have increased to the extent of 5 per cent., but we have not taken it at that; we have taken an assumed increase of 4 per cent. on the corresponding quarter of 1871, and by that means we raised the consumption of gas to the figure we think it would have been, had there been no strike in 1872—3,862,487,000 feet, showing an increase on the year 1871 of 1·39 per cent. Comparing that figure with the result of 1873, the increase of 1873 over 1872 is 1·19 per cent., and we have taken 1½ per cent. as a fair increase for the current year. The income as estimated for the commission of 1873 was £780,029 2s. 2d. based on a price of 3s. 9d. for common gas and 5s. 5d. for cannel, the quality at the time being 23 candles. The actual income was £298,195 17s. 6d.—the prices being 4s. 4d. for common, 5s. 5d. for 20-candle gas, and 6s. 3d. for 23-candle gas. The difference in the income is about £148,000, of which £110,024 is accounted for by the difference in price, and £38,143 to the increased quantity sold. The estimate for coke was £172,000, but it produced £205,205, owing to the large increase in price which ruled during the middle part of the year, when it varied from 25s. to 28s. There is a difference of nearly £5000 in the estimate of coal in the expenditure, which arises entirely from the increased consumption of something like 4000 tons. The price estimated comes out exactly in the result. For purifying materials the estimate was £10,600, while the actual expenditure was £14,400. After the estimate was given in for 1873 there was a supplemental estimate handed in as a further charge for purification during that year; it was then estimated that that further charge would be £2634, but the actual figures have even exceeded that by about £1200. The price of lime went up very materially during the latter part of the year, and is going up still. For repairs and maintenance of works the difference is very nearly £8000. That arises principally from Kensal Green; there has been a heavy expenditure there on wear and tear account for the past year, even more than we anticipated. The next is the meter account; the meters were put down at £13,000, and there was actually expended £20,000. In May of last year the directors issued the order that was referred to by the learned counsel, to the effect that all meters were to be inspected every three year, dividing the whole of the meters in the company's district into three, and for the year 1873 for the first time that charge appears. It will entail a still further charge for the next two years; all the meters that have been taken down that are found necessary having to be replaced. The directors issued that order with a view to stop as far as possible any leakage—unaccounted-for gas, as it is more properly called. The next item is rents, rates, and taxes, estimated at nearly £25,000, while £32,000 was actually expended. It is difficult to estimate the amount outstanding on taxes, especially in a company like ours, dealing with 150 parishes, and the balance outstanding on the 31st of December, 1872, was under estimated; that was one item. In the course of the year we had to pay a large arrear of land-tax, £1100; no one seemed to be aware of the fact till recently that the company were liable. The New River Company, of whom we bought the land, did not discover till recently that they had any claim on us. That is another item. Then the assessments in the eastern district, or rather in the Beckton district, are now going up very much, owing to the increased use we make of those works; those three things will account for that increase. There has been a diminution in the item of wages at the works, which were estimated at £106,000, but on which there was an actual expenditure of £86,000. At the latter end of 1872 there was a large increase in the rate of wages, and it was estimated that that increase would go on, but that has not gone on to such an extent as was anticipated. Again, the increase of 10 per cent. taken on all the wages paid by the company was not distributed over the various items under which wage are charged, but the whole was put down under the head of the manu-

fecturing wages, and therefore, though we get a large decrease under that head, I have no doubt that if we had analyzed them we should find the wages under other headings would be above the amount estimated; but the principal reason is that the 10 per cent. was not all required. The actual result of the working for 1873 produced a balance to be carried to net revenue of £295,200. The company did not earn their dividend of 10 per cent. for the year 1873 by something like £1100 or £1200. We could not carry anything to the insurance-fund; in fact, we used up very nearly the small balance we brought forward on the 1st of January last year. I believe the estimates for 1874 have been drawn up very carefully, and that they are fully justified by the working of the past year.

Cross-examined by Mr. CRIPPS: In the amount given by the commissioners last year there was a special reason given for the amount to be raised to make up the insurance-fund; it was calculated differently from the rest?

Witness: There was 1 per cent. on the paid-up capital of the company. It was deemed different.

Mr. CRIPPS: In point of fact, the whole of that has been treated as if it were one sum, and the same exactly has been done with it as if the commissioners made no distinction between what was for the insurance-fund and what was for the general fund.

Witness: We could not. We paid the Higgs defalcation account out of revenue. The commissioners refused to allow anything for that account, but it has been charged according to the terms of the amalgamation scheme and the Act of Parliament. The expenditure on meters has been made from motives of economy, and we hope we shall get some return. The consumption of gas in 1869 increased 6½ per cent.; in 1870, 5½ per cent.; and in 1871, 12 per cent.; but that rate of interest was purely exceptional, owing to the opening of the Beckton works, and our being able to give the consumers as much as they wanted.

Mr. CRIPPS: I find the average estimated expenditure as to the stokers strike was £5000, while the actual expenditure was £3895.

Witness: There were also certain law charges, bringing the amount up to £5000 as near as can be, which sum has been paid out of our ordinary revenue. Since the close of the year 1873 the company have offered for subscription £200,000 4½ debenture stock, and up to the present time we have allotted £146,000. That stock will require a sum of £7500 for payment of interest. We tried to raise that stock at 4 per cent., but could not, and therefore had to offer higher terms.

Cross-examined by Mr. PHILBRICK: The total expenditure for make, after giving credit for residuals, is 3s. 8¼d. The interest on capital is 1s. 6¼d. The cost of the coal is 3s. 6·09d., from which I deduct 15·75d. as being the total return from residuals, leaving the net amount for coals, 2s. 2·34d. The total working expenses are 1s. 5·85d.; and then there are exceptional receipts and exceptional payments, which do not appear in the revenue account; and that is a further charge of ·06d. I have not ascertained what has been the increase of consumption generally in the metropolis, because the best basis we can go upon is our own experience. It so happens that since we have been at Beckton, there has been no year which could be taken as a fair criterion, and therefore we must go back to previous years. The year 1868 was before any amalgamation took place; but in 1869 and 1870 the average was under 6 per cent. In the company's accounts for the half year ending June 30, 1873, the revenue account was debited with £4000 odd for the cost of revision; but, in the succeeding half year, it was found that that sum was not taken up for that purpose, and there is a credit of £800 odd, being the difference. Not half the items in that account are actually paid. To a great extent I am responsible for the estimates which are furnished to Mr. Parkes, and which he audits, and either accepts or rejects; but where I cannot form an accurate estimate by myself, I consult the other officers of the company. The consumers and the public are not admitted to the audit. There is no one else present except Mr. Parkes and the company's officers.

Mr. PHILBRICK: You state the unproductive capital of the company to be classed thus:—"First, old lands and works but partially occupied or ready for sale, representing £250,000 or thereabouts of unproductive capital; second, works constructed which are not yet earning as large a return as they are capable of doing; and third, large works in course of construction, as yet yielding no return of profit. The amount of unproductive capital under the second and third heads may amount to £300,000." That would be in addition to the £250,000 estimated under the first head?

Witness: I think it is so; under the second and third heads it may amount to £300,000. It is purely an estimate.

Mr. PHILBRICK: "Old land and works but partially occupied." My understanding of that was, that it was partially occupied for purposes of the company in the manufacture of gas.

Witness: Yes; our Westminster station, for instance. We do not keep those works in thorough repair. We look on them as temporary, and simply carry on the works as cheaply as we can. The Blackfriars station is partly unproductive, and that enters into the £250,000.

Mr. PHILBRICK: Last year that amount was larger—the amount of unproductive capital?

Serjeant SARGOOD said he objected to his learned friend cross-examining on the question of capital, whether productive or unproductive, on the ground that the commissioners had no jurisdiction to deal with the question of capital in any way; they were bound to accept it on Mr. Parkes's audited accounts as existing.

Mr. PHILBRICK said he wanted to ascertain what money had been expended by the company upon their works from which they were now earning a gas-rental, and to see what had been spent during the past year in maintenance and renewals.

Serjeant SARGOOD said the amount of capital expended was allocated by Mr. Parkes, and the question could not be reopened.

Mr PHILBRICK said that was a misconception of the functions which Mr. Parkes discharged.

The CHAIRMAN said he did not see that Mr. Parkes's audit was material at that stage of the proceedings.

Serjeant SARGOOD said the commissioners had to deal with a question which they had not in the Imperial case—the amount of capital paid up and expended—and he submitted that they were bound to accept Mr. Parkes's audited accounts as to the amount of that capital. That gentleman was an auditor on behalf of the consumers as against the company, and if he disapproved of the company's mode of distribution, he could cause it to be revised, and he had the power of stopping the payment of any dividend till it had been done. Whatever he certified, the commissioners were bound to accept, and they had no power to reopen his audit and say they thought he had made a mistake.

The CHAIRMAN said the commissioners had had occasion more than once to consider Mr. Parkes's position, and they were quite ready to make every presumption in favour of the result of his operations, but they did not think they were precluded from inquiring into the results of his proceedings for the purpose of their decision.

Serjeant SARGOOD: If you think so, of course I am quite satisfied.

Mr. PHILBRICK said he wished to call the attention of the commissioners to the 31st clause of the scheme, under which the City of London Company amalgamated with the Chartered, which provided for the sale of any land or plant not required by the company, the proceeds of such sale to go in reduction of the capital.

Serjeant SARGOOD said that by the 16th section of The Gaslight and Coke Company's Act, obtained in 1872, it was provided that, notwithstanding anything contained in the 31st section of the said scheme, the company might apply the net proceeds of any sale of land not required for the purposes of the undertaking to defray the expenses of any new works they were authorized to make, which was a very material alteration.

Cross-examination resumed: Blackfriars station was fully used during the winter months. I do not know what the company are going to do with that station.

Mr. PHILBRICK: You say there are works constructed which are not yet earning so large a return as they are capable of doing. There are works actually constructed, and if the demand were great you could manufacture more gas?

Witness: They would not have to be enlarged to meet the increased requirements. We have a quantity of land at Beckton which is not fully occupied, and the railway and river viaducts are all made larger than we want them, and at the present moment they are not earning their full amount of dividend. The item of large works in course of construction as yet yielding no profit relates partly to Bow Common—something like £15,000.

Re-examined by Serjeant SARGOOD: The amount required to pay interest upon borrowed money last year was £28,407, and the aggregate amount for dividend upon various amounts of capital, £262,240; together making £290,647. With regard to the interest account, some portion of it is for a part of the year 1873, and not for the whole, so that the same amount of debt would represent a larger sum for the current year than for the last year. The actual amount of interest, having regard only to the loans that existed at the end of 1873, and excluding the fresh loans raised in January this year, would be £28,400. The total amount required for dividend during the current year will be £271,500. In the June half of last year we had to make special payments independently of the dividends and loans; we had been very short of money the whole of the year, and we had to borrow from our bankers, involving a charge for interest of £1350. In the second half year there was a similar charge of £148, making £1498; but in the June half year there was a credit of £990, so that we were left with an aggregate revenue of £294,700; which is, in round numbers, £4000 beyond the sum we required for the absolute dividend and loan capital; so that, instead of getting what the commissioners said they intended us to have—viz., £29,024, in paragraph 15 of their memorandum—all we have got towards it is £4000. We hope this year, in getting the 1 per cent. per annum upon our capital, to be more successful. With regard to the question of wages, the difference of £20,000 does not mean that that amount has been saved.

Serjeant SARGOOD: One reason why there is a discrepancy is this, that the per centage of increase put upon the estimate for 1873 turned out considerably too large. Therefore the actual sum being less than you thought, of course the figure turns out to be less. But the difference, as I understand, must be looked at in this point of view, that the wages, or a portion of them, are put under manufacture, and a portion of them in other parts of your accounts in the ordinary course of keeping them.

Witness: Yes. In making our estimate last year of the aggregate increase, it so happened that we added the whole of that aggregate on to the wages at works in the manufacture instead of distributing it between that and other portions. A considerable portion of that £20,000 will be found in the item of wear and tear, which exceeds the estimate by £7800; and wear and tear is composed very largely of wages. If, instead of having the estimated wages £106,000, and the wear and tear £62,000, we had had wear and tear £68,000, and the manufacturing wages £100,000, that would have been the better figure. In making the estimate, the surplus has simply been added to the wrong figure.

By Mr. CRIPPS: The total share capital at the close of 1873 was £3,149,000; of that sum £247,529 was called up during the year.

By Mr. PATTISON: I have taken the price of coal during the year, which is not subject to contract, at 21s. 8d. per ton at the works. The average price of common coal to be delivered under contract is 25s. 9½d. The total quantity required, taking into account the stock in hand on the 1st of January, works out to 27s. 8¾d. per ton. The average price of the coal is 25s. 9½d., but that does not include lighterage and wages, which come to 1s. 2d. The following tables will explain the mode in which the figures are arrived at:—

Application to the Board of Trade for the Revision of Prices and Illuminating Power, 1874.

The coals required in the year 1874, to produce the estimated quantity of common gas for sale will be at the rate of 8200 cubic feet of gas sold per ton:—

	Tons.
3,225,000,000 cubic feet at 8200	393,292
Of this quantity 6 per cent. must be cannel	23,600
The remainder will be common coal.	369,692

The quantity required to produce the estimated cannel gas for sale will be—

767,000,000 cubic feet at 8200	93,540
Of which it will be necessary to provide 40 per cent. of cannel.	37,416
The remainder common coal	56,124

The quantities of common and cannel coal required for 1874 will be—

	Common Coal.	Cannel Coal.	Total.
Common gas	369,692 ..	23,600 ..	393,292
Cannel gas	56,124 ..	37,416 ..	93,540
	425,816 ..	61,016 ..	486,832

	Tons.	s. d.	£
The quantity of common coal in stock on Jan. 1, 1874, was	36,870	at 25 9½	47,585
The quantity already contracted for, to be delivered during the year 1874, is	314,761	„ 25 9½	405,933
The further quantity that will be required to provide for the year's consumption	74,185 say	„ 21 8	80,367
	425,816		£533,905
To this amount must be added the charges for freight, City dues, and metage upon 34,751 tons of Haywood Splints, at 10s. 3d. per ton			17,810
Also the cost of lighterage and cartage, averaging 1s. 8¾d. per ton on 173,967 tons			15,094
And wages on 338,946 tons at 1s. 2¾d.			23,904
			£590,713

Cost of common coals into retort-house . . . 27s. 8¾d. per ton.

Application to the Board of Trade for the Revision of Prices and Illuminating Power, 1874.

The quantity of cannel coal in stock on Jan. 1, 1874, was 21,761 tons, valued at £36,540, or 33s. 7d. per ton.

The total quantity required being 61,016 tons, it will be necessary to purchase cannel to the extent of 39,255 tons. Under contracts at present in force, the company have provided for the delivery of 65,954 tons, at an average price of 29s. 9¾d. per ton. Of this quantity, therefore, only 39,255 will be required for the current year, and the figures will be as follows:—

In stock on January 1, 1874	21,761 tons, valued at	£36,540
To be purchased	39,255 „ at 29s. 9¾d.	58,432
	61,016 tons.	£94,972
To this amount must be added the charges for freight, City dues, and metage on 22,500 tons from Scotland, say at 10s. 3d. per ton		11,521
Lighterage on 20,000 tons at 8d.		667
The remaining quantity will be delivered alongside the works, free of charge.		—
Wages on 39,255 tons, at 1s. 2¾d. per ton		2,412
		£109,572

Cost of cannel coals into retort-house . . . . . 33s. 11¼d. per ton.
Average cost of common and cannel coal into retort-house . 28s. 9¼d. „

Coke, 1874.

	Chaldrons.
It being estimated that in the year 1874, 425,816 tons of Newcastle coal will be carbonized, the coke made for sale, calculating at the rate of 24 bushels per ton, will be	283,877
The quantity of cannel coal used in the manufacture of common gas will yield, at the rate of 10 bushels per ton on 23,600 tons of coal	6,555
	290,432
In the manufacture of cannel gas 37,416 tons of cannel coal will be used, and will produce for sale, none being used for fuel, about 20 bushels per ton of coal = 20,787 chaldrons; but to carbonize this quantity of cannel coal, best coke is used to the extent of 12 bushels per ton	12,472
Leaving best coke for sale	277,960
And cannel coke	20,787
	298,747

1874. Total coke for sale, 61 chaldrons per ton.
1873. Ditto ditto 59 ditto.

	Chaldrons.
Of the quantity of best coke for sale	277,960
There will be at Beckton	159,000
Other stations	118,960
Beckton.—On Jan. 1, 1874, the stock of coke was	20,349
The estimated make for the year at this station	159,000
Total quantity to be disposed of during the year 1874.	179,349

	Chaldrons.	s.	d.	£
Contracts assigned to the company by Messrs. Locket and Judkins	2,870	at 19	3	2,762
	8,570	„ 19	0	8,140
	16,361	„ 18	6	15,134
	165	„ 15	0	123
Contracts entered into by the company	41,000	„ 11	6	23,575
	39,500	„ 10	0	19,750
Taken by Locket and Judkins in January	5,866	„ 18	0	5,279
	114,332			£74,763
Quantity remaining to be disposed of	65,217	estimated „ 10	0	32,608
	179,549			£107,371
Add fine paid by Messrs. Locket and Judkins on cancellation of contract				18,000
				£125,371
Deduct depreciation of stacked coke, 2055 chaldrons, at 10s.			£1,027	
Deduct wages on the whole quantity, including extras			10,500	
„ „ value of stock on Dec. 31 last			17,980	
				£29,507
Estimate, net proceeds of Beckton coke, 159,000 chaldrons (average 12s. 0½d.)				95,864
Other stations 118,960 chaldrons, at 12s. 10d. net				76,333
Cannel coke 20,787 „ „ 6s. 10d. „				7,102
Chaldrons 298,747				£179,299

The quantity of coal to be bought not under contract is in excess of the usual quantity so obtained. The way in which we account for the decrease in the sale of gas from June to September last year, as compared with the previous year, is this:—The public did not know until the end of April of the advance in price, and therefore during the first quarter they were burning pretty much after the usual rate, but when they found out the high price they would have to pay, they immediately economized their consumption. The increase in the amount of wear and tear in the last year is owing to the fact that in addition to the Beckton works, which then came in for a considerable share, we had to spend a large sum of money upon the Western works to put them in a proper state. We spent something like £17,000 upon that station which has been charged to repair and maintenance of works. The wear and tear during the present year will also be heavy, because we shall have to go on repairing at Kensal Green.

By Dr. Odling: The wear and tear, which in 1872 was £51,000, and in 1873 was £69,000, will in 1874 be £75,000. This arises from the fact that this year we have to put a new roof on the retort-house at Bow Common, and do some other works. We hope to complete the Kensal Green works this year. The "wages" for 1872 were nearly £89,000; for 1873, £86,000; and for 1874 they are estimated at £84,000. The decrease in 1874 on 1873 arises from the fact that during the early part of last year we were suffering at Beckton from the effects of the strike. The total working expenses of 1874 are calculated at less than 1873 per 1000 feet, arising principally from the decrease in wages.

Mr. *C. H. Parkes*, examined by Serjeant Sargood.

I am the auditor appointed pursuant to the Act of Parliament, for the purpose of auditing the accounts of this company, and to see—as between the public, the consumers, and the company—that they are properly kept.

Serjeant Sargood: I do not desire to ask Mr. Parkes any questions, nor do my friends. I introduce him that the commissioners may ask for any explanations they desire about the auditing of the accounts.

Mr. Cripps said he should like to ask one or two questions with reference to the mode of audit.

Witness: The accounts put before me are the accounts of the transactions of the company for each half year. Whether actually paid or not, whatever the expenditure attributable to the half year is, it is brought into the account. If I cannot get the actual figure, I am obliged to make an estimate, but for all moneys actually paid I require a voucher. The costs of the revision of last year are not paid, but I am bound to allow them in last year's accounts, as an expenditure attributable to the year. In auditing the accounts, my attention has been called to the sum set aside to the defalcation-fund. That sum was paid last year, and, simultaneously with that, the company paid 10 per cent. dividend. It was not in diminution of dividend. The Act of Parliament says that, "until the deficit is fully discharged, the company shall, out of profits which would otherwise have been available for the payment of dividend on the ordinary shares, in the first place, and before payment of any such dividend, carry over to the credit of the defalcation account the sum of not less than £2500 half yearly, until the entire sum standing to the credit of the same account shall equal the amount of the defalcation." And the remainder of the clause says, "Provided that, for the purpose of a revision of the scale of illuminating power and price, under the City of London Gas Act, 1868, such half-yearly payments shall be deemed to be payments in respect of dividend." The 26th clause states that, "If the clear profits of the undertaking in any year amount to a larger sum than is sufficient to make a dividend of 10 per cent., the excess beyond the sum necessary for such purpose shall from time to time, to the extent of 1 per cent. per annum upon the paid-up capital of the company, be invested in Government or other securities." That is a prior charge. The scheme does not say it shall be taken out of dividend. If it had, I should have known my duty. Now, that £5000 would have to be deducted out of the 10 per cent.; but they have not said that, therefore, not having said it, they have missed the point.

Mr. Cripps: the result is that the amount which the commissioners gave last year to the insurance-fund has gone into the defalcation account?

Witness: I cannot help that; it is the Act of Parliament.

Serjeant Sargood: To the extent of £4000 only; that was all we had to carry over after paying dividend.

Witness: I believe the commissioners took the right view under the scheme in not allowing the amount.

Mr. Philbrick: As it at present stands, if this is a lawful charge, the consumer of 1874 would be paying for Higgs's defalcations incurred years ago.

Serjeant Sargood: Certainly not.

Mr. Philbrick: It is in effect a payment, not in respect of the manufacture of gas, but to make good defalcations that existed before the amalgamation?

Witness: The defalcation is charged in that way, and there was, to that extent, no advantage given to the company. Suppose there had been more than enough to pay the insurance-fund, then any balance would have gone over to the following half year, and naturally, in any way, it must come out of the consumer's pocket. It does not matter what the price is, because all balances, being carried forward, go for the benefit of the following half year.

Mr. Philbrick: Suppose the insurance-fund were full the last year, and therefore nothing was required on that account, but only enough to make up the dividend to 10 per cent?

Witness: In that case the £5000 must come off before dividend, under the scheme.

By the Chairman: If the payment to the defalcation account was intended by the scheme to attach to the dividend, it ought to have been stated that the £5000 a year should be deducted absolutely from the dividend until it was discharged. Not finding any direction as to the deduction in this case, I turn to the Act, and I find that the insurance-fund does not arise till the 10 per cent. has been paid.

By Serjeant Sargood: All the debits on capital account are vouched payments, and never questions of estimate. Most of those payments are made under contracts, and there must, therefore, be a certificate from the engineer certifying that the work is done before payment is made.

Witness handed in some correspondence with the solicitor to the corporation n reference to the costs of last year's revision, which still remain unpaid, and the allowance of which in the company's accounts was objected to by the corporation until vouchers for the payment were produced.

Mr. *J. O. Phillips*, examined by Serjeant Sargood.

I am the secretary of the Chartered Gas Company. Under the City of London Gas Act, 1868, the illuminating power of our common gas is fixed at 16 candles, and the price at 3s. 9d., and the illuminating power of our cannel gas is 23 candles, and the price 5s. 5d. By the revision last year the price of the former was increased to 4s. 4d., and the latter to 6s. 3d. About the middle of the year we reduced the illuminating power of the cannel gas to 20 candles, with a corresponding reduction in price. This was in consequence of a representation made to us by our consumers in the district formerly supplied by the Western Company—the parish of Kensington—who had had 20-candle gas for 5s., and who objected to an increase in the quality and price. The Metropolitan Board of Works approving of the change, it was made accordingly. In reference to this revision, our existing contracts for the purchase of coal and for the sale of residuals formed the foundation of our estimates for 1874, as far as they go. For the remainder, we have based our calculations in part on past experience, and upon our opinions as to the prospects of the future. The cannel contracts which we made two years ago on very advantageous terms are still in existence, and to that extent our consumers have the advantage. Our receipts during a portion of last year were exceptionally large, and that accounts for the actual result of our trading exceeding what we estimated it would amount to. Our prospects as to coke this year are not equal to the experience of last. Prior to Oct. 1, 1873, our directors advertised, according to custom, for tenders for the whole of the coke made at the Beckton station. A large number of tenders were received, and the directors accepted the highest, which was at 18s. a chaldron, from people with whom they had dealt previously to a large extent, and who are well known as men of position and of very considerable substance. The price taken was a very high one, and shortly after the contract had commenced the cement-makers upon the river Thames and the Medway, who are our chief customers at Beckton for coke in large quantities, at first hesitated, and then refused to buy coke from our contractors at the price they had contracted to give, or any advance upon it. A sort of combination was entered into against the contractors, the cement-makers in the meantime holding off; and the contractors asked permission of the directors to stack the coke for a time, believing they could outlive the combination that then existed. Permission was given, and something like 25,000 chaldrons were stacked, the contractors meanwhile holding themselves responsible for every chaldron of coke so placed on the ground. At that period matters began to assume a serious aspect, and I called upon the contractors either to remove the coke which had been stacked or to pay for all that there was in stock. They redoubled their exertions, and after a short time were obliged to make an appeal to the directors to cancel their contract on the ground that they were utterly unable to make any more sub-contracts for the sale of coke. They had sold something like 36,000 or 40,000 chaldrons under contracts, at a price I think in advance of their own contract rate of 18s., and they offered to assign all those beneficial contracts over to the company. After some negotiation it was determined to take them over, and, in addition, that they should pay to the directors a forfeit of £18,000. A portion of that forfeit has been already paid, and the balance is to be liquidated by instalments spread over a given period. In the meantime they are, on behalf of the company, working out the beneficial contracts they had made, and we have since effected sales to a considerable extent as to quantity, but I am sorry to say at a much reduced price, because we are obliged to force the sale. The balance of something like 35,000 chaldrons more, which is not sold in advance, and which is still to be made, is saleable by the company from time to time at whatever price they can get. If we had insisted upon holding the contractors to their first arrangement, we should have ruined them, and we should not have been as well off as we are. With reference to the probable increase in the gas-rental this year, I think 1½ per cent. is a fair estimate. The consumption of 1872 was materially affected towards the end of the year by the stokers strike, so that the comparison between that year and last does not give a true result. A comparison of 1871 with 1873 would give a more fair proportion; it would come out less than the 1½ per cent. we have allowed. The increase of 12 per cent. in 1871 was due to the extra manufacturing power which then came into operation at Beckton, which enabled our consumers to take as much gas as they chose. The want of manufacturing power prior to that period obliged us to starve our supply. Up to within the last two or three years we have generally considered that our increase was something like 5 per cent., but then we had been for many years reducing our prices. Now that we come to a reversal of that state of things, the consumption will naturally be found to advance at a considerably less rate. With regard to the general management of our company, the board meet once a week, and we have two sub-committees each week, one a Committee of Finance, the other a Committee of Works. We have also a Coal Committee, which is revived from time to time when it is necessary to enter into fresh contracts.

Everything in the shape of expenditure passes under the review of the Finance Committee, and nothing is incurred in the shape of a debt without their supervision. The General Purposes Committee superintend the manufacture and management, and visit the stations. There is also a Supervision Committee, which meets every fortnight, and make a minute investigation of all the stations. The engineers and superintendents report to the Works Committee every Friday. The chief inspectors, who are responsible for the distribution

department, attend that committee, and make their reports to them. Our present board consists of gentlemen who have been directors for a long period, and are well acquainted with the administration of gas affairs. I consider that the whole of the business of the company is administered with judgment and care. I think we are just beginning to reap the advantages of amalgamation in the reduction of expenditure. The economies hitherto arrived at have chiefly had reference to office details; but we are now beginning to reap the benefit of the systematizing of the manufacture and distribution in the districts.

Serjeant SARGOOD: Last year the commissioners, in issuing the memorandum attached to their award, were good enough to make a recommendation for your consideration—and that was with regard to what is called the unaccounted-for gas. Will you be good enough to explain to the commissioners what your company have done during the past year in reference to that subject?

Witness: In the first place, in the City of London especially, there were a large number of unnecessary mains—mains rendered unnecessary by reason of the amalgamation of the three companies which formerly supplied the City. One main, certainly, in every street, has been taken up, and in some places two, and in some places even more; and one main is now doing the work, and sustaining the actual leakage which was formerly the case with three and sometimes four mains. The same thing also applies, in a less degree, to other portions of the district westward, where the mains of the Equitable, the Western, and the Chartered Companies were very frequently running side by side. Throughout the whole of the City there are thousands of service-pipes which have been lying in the ground, some of them for many years, which have been taken up and new ones laid down, and laid down upon a new system —or at least a system adopted by the Great Central Company, one of the last companies established. We lay them in wooden troughs filled with asphalte, and the pipes bedded in asphalte have been found, as far as the Great Central Company are concerned, to be preserved. It is a great preservative, and prevents leakage. We have adopted that system throughout the whole City, and are now applying it to the western end of our district in the same way. In the next place, the directors have turned their attention to the state of the meters in their district. The consumers throughout the district naturally prefer dry meters, as there is less trouble in dealing with them than wet meters; but I am sorry to say they do not answer the purpose of the company so well as they do the purpose of the consumer—their tendency is to register rather less than passes through them. The directors have determined, first of all, to remove every meter which is at all suspected of being wrong in its registration; they are all being brought in as rapidly as possible, and are being tested and (if found necessary) sent for repair or are condemned. In addition to that, every meter throughout the whole company's district is to be removed and brought in for examination every third year. They will be painted each year of a separate colour, in order that we may know at one glance when any given meter was brought in for examination. We hope, by keeping the meters in a better state of repair than they ever have been in before, and by perhaps adopting in many instances meters of an improved construction—and many of those have been in use in the district a long time—we shall reduce the unaccounted-for gas to a very large degree.

Serjeant SARGOOD: And with regard to the gas you are making now, I think upon an average you are making a larger quantity of gas per ton of coal than formerly was the case?

Witness: We are; our working is better, showing an improvement in manufacture.

Serjeant SARGOOD: Now there is another subject also. With regard to station-meters, what have you done with regard to them?

Witness: One of the recommendations last year was that the gas consumed at all the works should be measured. We, therefore, have fixed a meter at every station, and all the gas which is consumed about the premises is registered.

Serjeant SARGOOD: With regard to the gas examiners, I believe you have abstained at present from at all interfering with them?

Witness: We have. Our board thought it better that the gas should pass from the works into their hands without being meddled with in any way, rather than run the risk of imputations as to what had happened to the gas in its transit. Before leaving the question of leakage or unaccounted-for gas, I may mention one other source, and that is the difference in the quantity of gas supplied to the public lamps and the contract quantity. Every public lamp throughout our district has a governor to it, and those governors are all set to pass rather more than we contract to give, so that in the result, with a large number of public lamps, the loss is very considerable.

Examination continued: This loss comes under the head of unaccounted-for gas. The revision clauses in the Act of 1868 were not put in at the instance of the company. The City Gas Act was brought in, in direct antagonism to the company, as a consumers bill. The maximum price of gas in it was also reduced, very much against our protest.

Witness handed in two tables, one containing a comparative view of the aggregate workings of the companies now amalgamated in The Gaslight and Coke Company, and the other showing the per centage of increase in the sale of gas—1869 to 1873.

The commissioners sat again on Friday, when Mr. Phillips's examination was continued and finished. Mr. Harris, engineer of the Bow Common station, and Messrs. Cory and Dixon were examined. The commissioners then adjourned till Thursday, March 19. We shall resume our report, with the evidence of Friday last, in the next number.

LOCAL GOVERNMENT BOARD INQUIRIES.

RICHMOND, SURREY.

THE PURIFICATION OF THE THAMES.

The Richmond Rural Sanitary Authority having presented a petition to the Local Government Board, praying for power to put in force the Lands Clauses Consolidation Act, 1845, with respect to the purchase and taking of land, otherwise than by agreement, in the parish of Barnes, for the purpose of carrying out a drainage scheme for the district—comprising Barnes, Mortlake, Kew, and Petersham—the Local Government Board directed an inquiry to be held, and Major Tulloch, C.E., accordingly attended on Tuesday last, at the boardroom of the Richmond Workhouse, for the purpose of hearing evidence from persons interested for or against the scheme.

Mr. MICHAEL, barrister, represented the rural sanitary authority, while Mr. LAW, C.E. (on behalf of the Barnes Vestry), Mr. POCHIN, owner of the land proposed to be taken, General M'MURDO, whose house is opposite the proposed sewage area, and others, opposed the scheme.

Mr. LAW presented two petitions against the scheme, one signed by a large number of the inhabitants of Barnes, and the other by persons residing in the immediate neighbourhood of the proposed works.

Mr. MICHAEL, in opening the case on behalf of the rural sanitary authority, said that his clients, in common with other local authorities in the Thames Valley, had long since received a notice from the Thames Conservators, requiring them, under heavy penalties, to discontinue the flow of sewage into the river. That notice had expired, and they were indebted to the clemency of the conservators for the fact that they had not, like the Richmond Urban Sanitary Authority, been summoned and fined for neglecting to comply with the notice. To aid them in a solution of their difficulty they had consulted Mr. Bailey Denton, the agricultural engineer, and he had recommended the adoption of a system of intermittent downward filtration very similar to the process in operation at Merthyr Tydvil.

Mr. *Dyke*, medical officer of health to the rural sanitary authority at Merthyr Tydvil, said that before they adopted the intermittent filtration system they had frequent complaints and several injunctions, but since the adoption of Mr. Bailey Denton's plan, three years ago, they had had no complaints and no illness resulting from the drainage works. Large crops of mangold, cabbages, onions, rye-grass, &c., were grown on the land, and the farm had proved very remunerative. Cows were fed on the produce of the sewage area, and the milk was excellent both in quantity and quality. [A sample of the effluent sewage water was here passed round the room in a tumbler; one gentleman tasted it, and pronounced it to be quite harmless.] He believed the effluent water produced was purer than that which was drunk by many persons. He could honestly and thoroughly recommend other local authorities to adopt a similar scheme.

In cross-examination, *witness* said he could not say what the expenditure on the Merthyr sewage works had been.

In reply to General M'MURDO, *witness* admitted that the sample of effluent water just produced was diluted by the subsoil drainage.

By the INSPECTOR: There had been no illness traceable to the sewage works. They had a first-rate water supply at Merthyr—second only to that of Glasgow. The water contained only 2½ grains of lime per gallon, whereas the water supplied to London by the companies contained 16 grains per gallon.

Mr. *E. H. Leycester Penrhyn*, chairman of Quarter Sessions for the county, said that as an *ex officio* member of the rural sanitary authority he had taken great interest in the drainage question, and had visited the sewage works at Ealing, Barking, Croydon, and other places, for the purpose of acquiring information on the subject. After all their inquiries, they had come to the conclusion that irrigation was the best system, provided sufficient land could be obtained; but, situated as they were, in the midst of valuable building ground, they had decided unanimously that the best scheme for them was that which Mr. Bailey Denton had recommended.

By Mr. LAW: He did not know that there had been a memorial sent from the Barnes Vestry to the rural sanitary authority against the scheme.

The memorial alluded to was produced, and, although it was objected to by Mr. Michael on the ground that it was addressed to the chairman only, the inspector ruled that it might be put in.

Mr. *Bailey Denton*, C.E., said the population of the district had increased during the last ten years at the rate of nearly 50 per cent., and that he had allowed in his estimate for four times the present population. In all, 28 acres of land be purchased, and it would be drained two yards deep. A large reservoir would be constructed to receive the under-drainage water discharged from the filtering-ground during the rise of a tide, when the outlet into the river would be closed. On the fall of the tide, the reservoir, the bottom of which would be a few inches above low-water mark, would be emptied by means of self-acting tidal sluices. The sewer would be 23 feet below the surface at the pumping-station. He had estimated the cost of land and the construction of necessary works at £30,000; and if this sum were borrowed, a rate of about 6½d. in the pound would be required to pay off principal and interest in 30 years.

The inquiry was then adjourned till the following day, in order to allow the inspector an opportunity of visiting the land.

On Wednesday the inquiry was resumed, the greater part of the day being occupied in the cross-examination of Mr. Bailey Denton. The questions had reference to the suitability of the land proposed to be taken, and the efficiency of the works generally. Mr. Bailey Denton expressed confidence in the correctness of his estimates, and adhered to his former opinion that, although a small portion of the land near the river is clay, the site was one of the best in England for a system of intermittent filtration.

In answer to Mr. POCHIN, the *witness* admitted that there was a good deal of prejudice against sewage works; and added that, in order to meet this prejudice as much as possible, he had selected a site near the soap-works, so that two fancied nuisances might be together.

The INSPECTOR intimated that, before he reported to the Local Government Board on the scheme, he should take an early opportunity of visiting the sewage works at Merthyr Tydvil.

ROUNDTOWN, DUBLIN.

THE VARTRY RESERVOIR.

On the 26th ult., Captain ROBINSON, Local Government Inspector, opened an inquiry at Murphy's Hotel, Roundtown, to inquire into the alleged pollution of certain streams flowing through Roundtown into the Vartry reservoir.

Serjeant ARMSTRONG, Mr. NORWOOD, LL.D., and Messrs. RYAN, Q.C., and JOHN GIBSON, appeared for the board of guardians of the Rathdrum Union, who are the local and sewer authorities of the district, and through whose district it was alleged the streams were polluted, and the town not properly provided with sewers. Mr. HENRY appeared as counsel on behalf of Mr. Keogh, a landowner.

The INSPECTOR said his instructions from the Local Government Board on the present occasion were to inquire into certain facts at issue between the Dublin Corporation and the board of guardians of the Rathdrum Union, in reference to the drainage of the town of Roundwood, and the condition of certain streams flowing through it. It was alleged by the corporation that the Rathdrum board of guardians, who were the sewer and nuisance authority of the district, had neglected to provide sufficient drains and sewers in Roundwood to secure the health, comfort, and cleanliness of the town and its inhabitants, and to prevent the fouling and pollution of streams tributary to the river Vartry; that the sewers from several of the houses were discharged into the streams referred to, which were further polluted by the drainage and refuse of the fair green, and that the corporation had consequently been obliged to divert the course of the stream, and lose the water which otherwise would contribute to the supply from the Vartry reservoir. On the other hand, the board of guardians for Rathdrum Union stated that the streams running through Roundwood were in no respect in a different or worse condition than before the construction of the Vartry Water-Works, and were not polluted by sewers from houses to a greater extent than was the case at that period; that the streets and fair green were in no worse state than they were when the corporation commenced their works; and they believed the sanitary state of the town was in every respect satisfactory. These were the principal points at issue between the two parties, and he was now ready to hear any evidence that might be tendered to him on the subject.

Mr. RYAN submitted that the case was *coram non judice*, and the INSPECTOR stated he would take a note of the matter.

Serjeant ARMSTRONG then stated the case on behalf of the corporation. He relied on the 49th section of the Sanitary Act (1866) as giving jurisdiction, and read the order which he would suggest should be made to meet the exigencies of the case. The loss of water of three streams which had to be diverted from the reservoir in order to prevent pollution was no less than half a million of gallons per diem, and valued at £150 per annum, more than sufficient to supply the township of Kingstown and Dalkey. The discharge of sewage from Roundwood was about 1000 gallons per diem. Under the Water-Works Clauses Act, which was embodied in this special Act, they were bound to maintain and keep in the Vartry and its tributaries a pure and wholesome supply of water. It was no trifling matter to the corporation and the citizens of Dublin, whom they represented, to lose this valuable quantity of water. The reservoir

on the Roundwood side was separated from the adjacent lands by a wall, and there was a strip of ground very fortunately between the wall and the waters of the reservoir, and upon that strip, and although upon their own ground, they were obliged to cut a drain and carry the water a mile and a half or two miles below the reservoir, so as to cut off the polluted water from the reservoir. The corporation were not seeking to deprive the people of Roundwood of one gallon or one pint of water. It was not proposed to interfere with the ordinary enactments, such as the watering of cattle here and there, or for domestic purposes, or to interfere with the pure flow of the water in its ancient and accustomed beds. They did not blame the people of the town for the present state of things, which led to the threatened pollution of the Vartry to the extent that rendered it necessary to make the intercepting drain he had spoken of. The first medical testimony in the country had been applied to this investigation, and it would be proved that if the water of the polluted streams were permitted to get into the Vartry reservoir, the effect would be to render the whole water of it dangerous to the public health. The moment the alarming character of the pollution showed itself, the chairman of the Water-Works Committee, Sir John Gray, took immediate steps, under the advice of engineers, to have an intercepting drain constructed. It was made, not at any great expense, but at great sacrifice of water, and he had no doubt that neither a court of law nor of equity would hold that, because, rather than run the risk of the pollution, they made a temporary contrivance to avert it, they had disentitled themselves to have a proper system of sewerage in the district for the purpose of putting an end to such a dangerous state of things. The plan which the engineers suggested to prevent the pollution of the three streams was a very inexpensive one; and, as to the jurisdiction of the inspector, there could be no doubt it was ample. He believed that when the minds of the guardians of the district were disabused of the idea that great expense would be entailed upon them, they would be the last people in the world that would perpetuate an injury to the public health.

Mr. *Park Neville*, city engineer, and Mr. *Andrews*, assistant engineer, were examined, and described the position of the streams that were being polluted, and pointed out the various sources from which the pollution emanated. Prior to the construction of the intercepting drain, that water went into the reservoir. They estimated that the average loss of water at present by the streams being diverted into the intercepting drain was half a million gallons a day, the value of which was £1500 a year. They also described the plan which they had suggested for getting rid of the evil, and stated that in their belief it would be effectual, and that the cost would be about £500.

Dr. *Cameron* was next examined, and deposed that he had made an examination of the town, and found some of the out-offices in a filthy state, and that the objectionable substances found their way into the streams alluded to. He found, however, that an intercepting drain had been cut round the reservoir in such a way as to receive and carry off the polluted water, none of which now entered the reservoir. He had analyzed a specimen of the water taken from one of the streams, and found it contained 12·34 grains of solid matter; 0·5 grains of ammonia to the gallon. The solid matter should not be more than 4½ grains, and the ammonia 0·002 grains. He stated that two-thirds of the solid matter contained in this water belonged to sewage, and that if the water got into the reservoir it would be dangerous to health.

Dr. *Mapother*, Dr. *Moore*, and Dr. *Grimshaw* were also examined, and gave confirmatory evidence of the danger to the public health which would result from the polluted water getting into the reservoir.

Sir *John Gray*, chairman of the Dublin Water-Works Committee, having given evidence as to the steps taken to ameliorate the condition of things, so soon as the fact of the pollution was established, by the making of the intercepting drain,

Mr. RYAN addressed the inspector on behalf of the Rathdrum Guardians. He stated he did not mean to controvert the evidence of the doctors that it would be most desirable for the citizens of Dublin to have such a work constructed at the expense of the guardians of the Rathdrum Union, but he did not think the inspector would see the necessity of imposing such a duty on them.

A number of witnesses were then examined to prove that the sanitary state of the town was extremely good.

Mr. GIBSON and Serjeant ARMSTRONG having replied,

The INSPECTOR stated that he would report to the board immediately, and the proceedings then terminated.

BRENTWOOD.

On the 9th inst., an adjourned inquiry was held in the Petty Sessions Room by Major TULLOCH, from the Local Government Board Office, to ascertain the justice or injustice of the allegations made by the Brentwood Rural Sewer Authority, as against Messrs. Russ and Minns, the engineers who carried out the drainage works in the town. After the completion of the drainage works by Messrs. Russ and Minns, the hamlet refused to take over the works, or to recognize them; but when the new Sanitary Act came into operation, the board of guardians were constituted the sewer authority, and were made responsible for the expenses of the works. The board of guardians appointed a Sanitary Committee for the hamlet, under the provisions of the late Act, and when this committee got into working order they alleged that there were many defects in the construction of the works, whereon they wrote to the Local Government Board, refusing to take them or acknowledge them. The board thereon sent down Major Tulloch to inquire into the justice of the allegations, and after various points of the works had been inspected, the inquiry was adjourned until Monday last in order to investigate more fully the charges against the then sewer authority (Messrs. Russ and Minns).

Mr. BAKER, on behalf of the authority, entered into a statement to prove that the drains in various parts were not of the required depth, that the connexions between the old and new sewers were improperly made, that the bricks used for the construction of the brick sewer were not according to the contract, that the eruption on Brook Street Hill was caused by the then sewer authority failing to lay the sewer properly—instead of excavating, performing it by a process of tunneling—and various minor charges. He referred to the manner in which the sewage of the town had been passed over to Mr. Preston, of Harold Wood, maintaining that they had received no rent from Mr. Preston, that Mr. Preston defied them, and that he had the power, through the inefficient agreement, to leave the farm at any time, thus having the ratepayers at his mercy.

Mr. RUSS replied at great length. He could not always be personally present when the works were constructed. He had only heard one or two complaints. As to the insufficient depth, that was caused through some of the pipes being of too great a depth. The trenches were all 7 feet in depth, but some of the pipes occupied 2 feet, and thus it appeared that they were only 5 feet in depth in some places. As to the bricks, they were confined to the contract to local makers. As to the fall on Brook Street Hill, it was through the local surveyor employed by the Highway Board not properly constructing the cross road pipes to take off the surface water. As to the lease of the sewage farm, that was submitted to the Local Government Board, and then to the council for the Crown, who fully endorsed the arrangement, and they were therefore not responsible for it.

After hearing the statements advanced, the inspector said he would make a report upon it.

DRAINAGE OF TWICKENHAM.—At a meeting of the Twickenham Local Board, on Thursday last, a letter was read from the Local Government Board, with reference to the proposed scheme for diverting the sewage of Twickenham from the Thames, in compliance with the requirements of the Thames Conservators. Respecting the site from which it was proposed to pump the sewage, and the land proposed to be utilized by irrigation, the Local Government Board particularly drew attention to the following extract from Major Tulloch's report:—"The pumping-station is too close to the town. I do not think that the health of the inhabitants would be in any way affected by its proposed position, but the value of the houses near it might be depreciated. In cases of this kind it is the duty of the sanitary authority to consider the aspect of the sewage question. The mere fact of the existence of a sewage-pumping station in any neighbourhood close to a town is of itself sufficient in many cases to destroy the value of the land near the station for building purposes. I therefore think that the sewage should be pumped farther away from Twickenham. Then, again, the sewage should not be utilized so close to the town as is proposed, especially when the board have a large tract of land in the neighbourhood of the Hounslow powder-mills to choose a suitable plot from."

DRAINAGE OF BRENTFORD.—At a meeting of the Brentford sanitary authorities, on Wednesday, a communication from the Local Government Board, in reply to an application for advice in regard to the sewage of the town, was read. The board advises the preparation of a drainage scheme by a competent engineer, and expresses its readiness to consider an application for borrowing powers to carry out the scheme. The report of the Government inspector who conducted the late inquiry into the sanitary condition of Brentford having been read, the consideration of the subject was deferred for three weeks.

DRAINAGE OF TOTTENHAM.—The Lea Conservancy Board have informed the local authority at Tottenham, who have recently been at great expense in constructing new tanks, and adopting the system of dealing with the sewage by the lime process, that the plans adopted can no longer be tolerated "as the best known practical means" of purifying sewage. They also state that they have been informed that a certain process in use at Ponder's End for some months past was producing very satisfactory results with regard to the effluent water, which was discharged into the Lea. A committee of the Local Board of Health have, therefore, visited the works at Ponder's End, and are convinced of the necessity of immediate action, and of meeting the claim made upon them by the Conservancy Board.

BRIGHTON GASLIGHT AND COKE COMPANY.

The Half-Yearly Ordinary General Meeting was held at the Offices, St. Swithin's Lane, London, on Thursday, the 26th ult.—G. WALNE, Esq., in the chair.

The following report and statements of account were submitted:—

The demand for gas during the past six months has been but slightly in excess of that of the corresponding period of the previous year, notwithstanding a fair increase in the number of lights. This may be attributed in some measure to a milder season, but is probably owing in a greater degree to a disposition on the part of consumers to economise in gas. It is certainly remarkable that the public, misled by unscrupulous representations, appear to lose sight altogether of the important fact that, for 4s. (the present price of gas of excellent quality in Brighton), they are supplied with means of artificial light far beyond what could be obtained by an expenditure of £3 in the purchase of the best sperm or wax candles procurable. In truth, coal gas must be nearly—if not quite—the cheapest article of domestic consumption. Surely those who benefit so largely by the enterprise of gas companies should not grudge them the slender reward to which they are entitled.

Debentures amounted to £2800 fell due in October and have been paid off.

The directors recommend the declaration of a dividend, for the half year ending the 25th of December last, of 5 per cent. on the old shares, with a proportionate dividend on the paid-up portion of the new share capital, due allowance being made for the period at which the fourth call was paid; the same, less income-tax, to be payable on and after the 9th March next.

The directors have the melancholy duty of recording the decease of their venerable colleague Mr. Henry Wheeler, chairman of the company, who for upwards of 30 years, until prevented by failing health, took a most energetic share in the direction of its affairs. Mr. John Miles, the auditor, has been appointed to fill the vacancy at the board thus occasioned.

Two of the directors, Mr. Weiss and Mr. Wilbraham, retire by rotation, but are eligible for immediate re-election. The vacant auditorship has to be filled up.

Dr. *Profit and Loss Account, for the Half Year ending Dec. 25, 1873.* *Cr.*

Coals			£13,214	10	5	Gas and meter rental	£18,000 1 9
Materials for purification			319	19	0	Coke, &c.	7,921 6 0
Wages			1,737	4	6	Interest Account	27 4 1
Rent, rates, and taxes			210	16	6		
Salaries, collectors commission, directors, and auditors			1,306	16	9		
General charges			154	6	9		
Depreciation account			740	0	0		
Wear and tear			2,718	3	10		
Bad and doubtful debts and allowances			307	18	0		
Interest on debentures			174	3	7		
Contingency-fund			580	0	0		
Parliamentary and law			85	0	0		
Balance			4,319	12	6		
			£25,928	11	10		£25,928 11 10

Dr. *Balance Sheet, Dec. 25, 1873.* *Cr.*

Capital			£88,000	0	0	Expended on works	£85,290 14 3
Debentures			6,200	0	0	Meters	2,017 10 11
Contingency-fund			5,775	12	6	Works in progress	149 16 10
Depreciation account			2,377	3	11	Coal, coke, &c., in stock	6,742 3 5
Coal insurance account			1,737	1	1	Mains, service-pipes, and general stores in stock	1,037 7 0
Dividends unpaid			1,305	11	7	Sundry debtors for gas	12,528 12 7
Interest on debentures			52	17	8	Sundry debtors for coke, &c.	4,406 17 8
Tradesmen's accounts, &c., owing			3,091	19	6	Cash at bankers, in hand, and on deposit	2,837 1 0
Loan account			2,000	0	0		
Profit and loss balance—							
From last half year	£155	5 9					
This half year, as above	4319	12 6					
			4,474	18	3		
			£115,015	4	1		£115,015 4 1

The report having been received and adopted, it was resolved that a dividend for the half year ending the 25th of December last be now declared of 5 per cent. on the old shares, with a proportionate dividend on the paid-up portion of the new share capital, due allowance being made for the period at which the fourth call was paid; the same, less income-tax, to be payable at the offices of the company, 13, St. Swithin's Lane, London, on Monday the 9th of March and three following days.

Mr. Frederic Foveaux Weiss and Mr. Roger William Wilbraham were re-elected directors and Mr. Michael Sarson was elected an auditor of the company.

The thanks of the meeting were given to the directors and auditor for their attention to the affairs of the company; the thanks of the meeting were also given to Mr. Rutter, the manager, Mr. Weare, the secretary, and the other officers of the company.

RESIGNATION OF THE MANAGER OF THE CARLISLE (CORPORATION) GAS-WORKS.—Mr. J. Hepworth, the manager of these works, has resigned his office in order, we believe, to enter into partnership in a manufacturing establishment in the neighbourhood of the city. His retirement from the post which he has filled so efficiently at the gas-works is regarded with general regret.

DOVER GAS COMPANY.

The Half-Yearly Meeting was held on the 3rd inst.—Mr. W. R. Mowll in the chair.

The Chairman opened the meeting by reading the report, which was as follows:—

In laying before you the accounts for the half year, we think they show matter for congratulation in view of the circumstances through which we have recently passed.

Considering the rise in price of gas last summer, the falling off in consumption, compared with the corresponding period of 1872, has been trifling, and the result evinces that our dealings with the rise in price to the public and our corresponding arrangements with our managers were founded upon sound commercial principles.

The balance-sheet shows the sum of £1575 5s. 8d. available for dividend out of the profits of the half year, we accordingly recommend a dividend at the rate of 6½ per cent. per annum, and after its payment shall be able to carry forward £80 5s. 8d. to the reserve-fund.

We have continued to retain Mr. Alexander Bottle as inspector of the quality and pressure of the gas supply. We consider his services invaluable, and the outlay a very beneficial one for the company, not only as enabling us to satisfy ourselves that our contract with our managers is faithfully performed, but as giving the public confidence in our dealings with them.

Messrs. Anderson and Jones have repeated their application for an enlargement of the gasholder in Russell Street, which has been referred by us to Mr. Kirkham for his report, and we propose to act in conformity with his recommendations on the subject.

The Chairman added that since the report was in print the directors had lost one of their colleagues in the person of Mr. Tiffin. He might say that it was always a pleasure to act with him; and they could hardly say his decease was untimely, as he understood he lived to be 78 years old—a good, ripe old age. Acting upon the powers which the Act of Parliament gave them, the directors had elected Mr. Willshire Mannering on the board to supply Mr. Tiffin's place. With these remarks he had to move that the report read be received and adopted.

Mr. Shipdem (deputy-chairman) seconded the resolution.

Mr. Barnett said he noticed that the amount of the rates, £408 14s. 9d., was a little more than a quarter of the dividend. Was that an advance, or was it the usual amount?

The Secretary said it was a fair proportion of the half year upon what had been paid.

Mr. Mills asked whether the charge for rates was not a charge upon the shareholders, and whether the managers did not formerly pay it.

The Chairman replied in the affirmative.

Mr. Mills then asked how it was that the directors had allowed the managers to get away from that charge, after the agreement. It was taking away a large part of the revenue of the shareholders.

The Chairman said it was a part of the arrangement which, after due discussion, the directors felt it in the interest of the company at large to make with the directors. If the managers had not been relieved of the amount they paid in taxes, they must have been paid a much higher price for the manufacture of gas.

Mr. Mills: But there was a stated price for the manufacture of gas in their lease.

The Chairman: Yes, but it will be in your recollection that circumstances occurred which rendered it expedient that the terms of the arrangement with the managers should be altered.

Mr. Mills thought it was a very bad arrangement for the shareholders.

Mr. Jones said if he might be allowed to do so he would explain the matter. The shareholders present were aware that for several months it was a question between the managers and directors as to the desirability of raising the price of the manufacture of gas on account of the increased cost of coal. Twelve months ago the poor-law guardians raised the rating of the gas-works some 250 per cent.; the rating then was on Anderson and Jones, the managers. He appealed successfully to the Assessment Committee, by pointing out to them that under the then existing state of things the gas-works ought not to be rated at all, inasmuch as, looking at the then price of coals, and the price of gas, there was no profit for managing the works, and consequently there was no beneficial occupation. Upon that the Assessment Committee relieved them of the taxes, and very justly observed that here was property worth some £60,000 which was not assessable to the relief of the poor, which was a most inconsistent state of things; and on that they passed a resolution assessing the company instead of the managers. After that negotiations were continued between themselves and the directors as to the amount that should be awarded to them in consideration of the increase in the cost of coal, and during these negotiations it was thought desirable on both sides that the company should take upon themselves to pay the rates, and that they (the managers) should raise the price of their gas proportionately to the cost for coal, less the amount of rates, which were to be borne by the company in future. Now, with reference to the cost of gas, the meeting was probably aware that it was based upon the principle of a sliding scale; that was, the price of coal was ascertained to be a certain sum 12 months ago, and upon that a certain price was fixed for gas per 1000 to be charged by the managers to the company. Since then the cost of coal had been reduced, and in the month of May the directors and themselves would meet again to adjust the price of their gas for the coming six months, and on that occasion, he had no hesitation in saying, there would be a reduction of something like 2d. per 1000, which would make a difference to the company of something like £660; that was to say, for the half year commencing June next and ending December next the company's revenue would be increased by something like £330 odd. The rates remain chargeable to the company; whether the company could appeal against them and get them reduced it was not for him to say. The matter had been discussed by the directors, and it was a part of the arrangement between them and the managers; and, with every respect, he submitted it was a very fair arrangement.

Mr. Barnett said that the removal of the rates from the managers to the company was a very serious matter, and would perhaps lead the shareholders to keep their eyes open so that nothing further of the kind might take place.

The Chairman thought the matter was very fully considered at the time the arrangement was made. It was, however, a point that could not very easily be put before a general meeting of this kind. The rating was certainly a little higher than was anticipated it would be at the time the arrangement was made with the managers; but, on the other hand, it became necessary to keep their eyes open as to the arrangements they made with the consumers. The rates must be paid by somebody, either by the managers or by the company, and it was the managers own election that the directors should take the charge off their shoulders; and, all things considered, he did not think it was an unwise arrangement—it really would not affect the dividends one iota in the future.

Mr. Jones added that the new arrangement was based upon the sliding scale. Assuming the cost of coals went down to its old price, then the price charged by Messrs. Anderson and Jones to the company for gas would be much less than it used to be under the old arrangement, and the reduced price which would then be paid by the company would more than clear the rates payable by the company.

Mr. Barnett: I should be very glad to see it.

Mr. Druce: And will the increased quality of gas continue?

Mr. Jones: Yes.

The report was then adopted, and a dividend declared of 6½ per cent. per annum.

Mr. Jones, in proposing a vote of thanks to the chairman and directors for their services during the past half year, congratulated the meeting on the fact that they had met on this occasion under much pleasanter circumstances than they did twelve months ago, and expressed a hope that the directors and managers might continue to work together in the same smooth way in which they had during the last half year.

The Chairman briefly acknowledged the compliment, and the proceedings terminated.

READING GAS COMPANY.

The following report and statements of account were presented at the meeting of the shareholders on the 23rd ult.:—

Your directors, in presenting the half-yearly statement of accounts to Dec. 31, 1873, have great satisfaction in being able to recommend that full dividends be paid on all the stocks and shares of the company, such dividend to be paid on the 1st of March, in accordance with the scheme set out in dividend account.

Your directors have peculiar pleasure in presenting the profit and loss account, because the half year just closed has had to bear the greatly increased price of coals and other materials used in the manufacture and distribution of gas. But owing to advantageous contracts for coals made prior to the highest market quotations of the past summer, and to increased prices having been obtained by them for coke and other residual products, they are able to congratulate the shareholders that the trial has been sustained, the recent state of the markets showing unmistakeably that prices of coals and iron have passed the maximum.

The works of the company continue to be most efficiently managed by Mr. Baker, the company's engineer. Your directors have also great gratification in stating that, owing to arrangements which he has made, the men employed on the works have been enabled to participate in a religious service at King's Road station, kindly supplied by the Reading Town Mission, on Sunday afternoons.

The directors retiring by rotation are Messrs. Blandy, Eisdell, and Player; and the retiring auditor, Mr. John Wilder. These gentlemen are eligible, and offer themselves for re-election.

Dr. Profit and Loss Account, for the Half Year ending Dec. 31, 1873. *Cr.*

Coals consumed			£6,727	12	5	Gas-rental	£10,124 10 10
Purifying materials			44	9	1	Coke	2,609 16 8
Meters			71	19	3	Tar and ammoniacal liquor	1,046 2 9
Fittings			86	6	8	Rents of tenements	12 0 7
Materials			361	9	2		
Contingency-fund			355	0	0		
Wages			1,698	14	0		
Salaries, &c.			663	16	2		
Tradesmen's bills			363	10	9		
Rates, taxes, &c.			431	5	9		
Interest			253	16	0		
Barge account			44	11	0		
Bad debts and allowances			43	8	2		
Miscellaneous			87	4	11		
Balance			2,559	7	6		
			£13,792	10	10		£13,792 10 10

Balance-Sheet, Dec. 31, 1873.

Share capital paid up			£60,000	0	0	Cost of plant, &c.	£74,391 13 9
Mortgage debt			11,000	0	0	Amount due for light	7,060 19 4
Premiums on shares			3,524	0	0	Coke	1,413 0 7
Debts due to sundries, viz.:						Tar and ammoniacal liquor	574 17 11
Coal			1,308	17	4	Fittings	93 10 9
Coke			30	3	6	Stock on hand:	
Purifying materials			26	14	2	Tar and ammoniacal liquor	223 14 1
Meters			9	7	10	Purifying materials	106 0 0
Fittings			24	6	11	Coals	2,730 12 0
Wages			2	15	0	Coke	244 9 0
Materials			100	1	7	Meters	80 6 0
Tradesmen's bills			73	1	1	Fittings	120 0 0
Rates, taxes, &c.			445	8	11	Materials	779 10 0
Barge account			21	3	6	Office furniture	40 0 0
Salaries, &c.			159	14	4	Barge	119 14 0
Miscellaneous			36	15	5	Petty cash in hand	65 0 0
Balance contingency-fund			150	16	1		
Unclaimed dividends			93	19	9		
Reserve-fund, £2500, and dividends accrued thereon, invested in £2949 18s. 7d. New Three per Cent. Stock			—				
Ditto, amount set apart Aug., 1873, and dividends received to be invested			543	14	0		
Balance due to bankers			1,639	11	7		
Balance brought from last accnt. —dividend account	£6,793	8 11					
Less carried to reserve-fund	500	0 0					
	£6,293	8 11					
Profit and loss account	2,559	7 6					
			8,852	16	5		
			£38,043	7	5		£38,043 7 5

Manufacture of Ammonic Sulphate from Organic Nitrogenous Waste.—Waste scraps of leather, horn, feathers, sponges, and wool, being partially dissolved in caustic soda, then mixed with slaked lime and distilled in iron retorts, give off a plentiful quantity of ammonia. M. L. l'Hote proposes to pass the ammonia gas into receivers containing chamber acid, and thus form an impure ammonic sulphate. By raising the heat at the close of the operation to a red heat, nothing will be left in the retort but sodic carbonate and quick lime. The addition of water coverts these into caustic soda and calcic carbonate.—*Polytechnisches Notizblatt.*

Longton Gas Company.—The report of the directors, submitted to the half-yearly meeting on the 27th ult., stated that the company had had to pay a great increase in the price of coal, and also an increase in the expenditure for labour and material in the manufacture of gas. On the other hand, an increased amount had been derived from the sale of coke, an additional amount being also made for sale, owing to the use of slack for fuel in heating the retorts, which had been found cheaper than coke. The revenue and profit and loss accounts showed the net profit realized was sufficient to pay the following dividends, which the directors recommended to be declared—viz., 10 per cent. per annum on the original shares, and 7 per cent. per annum on the ordinary 7 per cent. shares, and the payment of the arrears of dividend of 2 per cent. per annum, due for the half year ending June 30, 1869, all free of income-tax. In consequence of the insufficient pressure of gas in several parts of the company's district, the directors had deemed it advisable to lay larger mains in place of those at present laid down, and also to make an extension in the manufacturing department. The issue of the 1000 ordinary 7 per cent. shares being all paid up, notice had been given of an extraordinary meeting of the proprietors, to be held on that day, when a resolution would be submitted to raise additional capital to the extent of £5000. The directors congratulated the proprietors that the last instalment of the rent-charge for goodwill to the Stoke Gas Company had been paid. The report was adopted, and Mr. Felix Hawley was re-appointed auditor. At the conclusion of the ordinary business, an extraordinary meeting was held in reference to raising further capital, rendered necessary in consequence of a proposal for laying down larger mains in some districts, and extending the manufacturing departments to meet the wants of the town. It was decided to raise additional capital to the extent of £5000, in 500 shares of £10 each, as the second issue of ordinary 7 per cent. shares.

METROPOLIS GAS SUPPLY.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the gas consumed in Marylebone during the month of February:—

—	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 23 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Comp.'s gas	16·30	16·91	15·60	21·93	9·40	22·88	0·26	No trace
Chartered Company's common gas	16·45	17·04	15·81	25·91	12·23	19·73	0·36	No trace
Chartered Company's cannel gas	20·76	21·30	20·13	21·11	11·95	23·16	0·53	No trace

Mean of daily readings of barometer . . . 29·88
" " " thermometer . . . 56·85

* Each observation consists of ten readings of the photometer, at intervals of one minute.

During the month the mean illuminating power of the Imperial Company's gas was equal to the light of 16 and a third sperm candles; it ranged between 15·60 and 16·91 candles. The mean amount of sulphur found in 100 cubic feet of this gas was 22·88 grains, and of ammonia a quarter of a grain. The mean light of the Chartered common gas was equal to nearly 16½ candles; it ranged between 15·81 and 17·04 candles. Once it exceeded 17 candles. The mean amount of sulphur found in it was 19·73 grains, and of ammonia about a third of a grain. The mean light of the cannel gas was equal to 20·76 candles; it ranged between 20·13 and 21·30 candles; thus showing that on no occasion was it below the legal standard. The mean quantity of sulphur found in it was 23·16 grains, and of ammonia half a grain. The pressure of all the gases was generally good, and on no occasion was sulphuretted hydrogen detected in either of them by the usual tests. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the Chartered Company's gas manufactured at their works, Beckton and Bow.

At the meeting of the Metropolitan Board of Works on Friday last, the solicitor brought up a report with reference to the decision of the gas commissioners on the application of the Imperial Gas Company for an increase in the price of their gas. On the motion of Mr. Runtz, it was agreed that the report of the solicitor should be printed and circulated amongst the members of the board. The General Purposes Committee made a report, recommending that Mr. J. V. Taylor, the gas examiner at the Peckham testing-place for the gas supplied by the South Metropolitan Gas Company, and Mr. T. Keates, the gas examiner at the Chelsea testing-place for the gas supplied by the Imperial Gas Company, be permitted to exchange their respective stations, the terms and conditions of the original appointments remaining the same in both cases. The report was adopted.

THE METROPOLIS GAS BILL.—As we predicted when this bill was deposited, it has failed to pass the Examiner of the House of Commons. When called on to pass the Standing Order proofs, although no opposition was made to the bill, the promoters did not put in an appearance, and it was therefore struck out as a dead bill. On the first deposit of this bill no name appeared as sponsor; but, when printed, the name of Mr. George Flintoff appeared, we presume on account of his connexion with the so-called Gas Consumers Association. We anticipated then that when Parliament met, the bill would disappear; and so the result has proved. We regret that these attempts should be made by those who have not the power to carry them out. With the best intentions on the part of promoters, the occasion is sometimes seized upon by others, and forms, no doubt, a good basis for the operations of those philanthropic gentlemen who, wearing white "chokers," wait upon their fellow-creatures—the gas or water consumers, or income-tax payers, as the case may be—and who explain to their benighted fellow-men the unfair way in which they are treated, and who lead their victims to think that the unjust impost is sure to be removed if they will only sign a memorial to the House of Commons. But, generally speaking, the matter does not end by the memorial being signed; a little black book is produced from the depths of the pockets of the philanthropists, in which the injured victim is also requested to append his signature, together with a material guarantee to it in the shape of half-a-crown or five shillings. These gentlemen, generally speaking, hunt in couples, like hounds; and we believe the advantageous arrangement to themselves is that they divide with somebody else the pecuniary results of their arduous avocations.—*The Metropolitan.*

METROPOLIS WATER SUPPLY.

Dr. Whitmore's report on the composition of the Thames companies and other waters as supplied in Marylebone during the month of February:—

—	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by incineration of Solid Matter in previous column.		Hardness before boiling in degrees.	Hardness after boiling in degrees.
	Feb., 1873.	Feb., 1874.	Feb., 1873.	Feb., 1874.		
Distilled Water . . .	0°	0°	0°	0°	0°	0°
West Middlesex water .	19·88	20·92	0·94	0·88	14·01	3·14
Grand Junction water. .	20·46	21·24	0·98	0·88	14·25	3·24

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

The water supplied to the parish during the month by the West Middlesex and Grand Junction Companies maintained generally the purity and brightness of the previous two or three months. On one or two occasions the West Middlesex water did not appear to have been so efficiently filtered as it usually is. It is interesting to observe how much the hardness of Thames water is reduced by boiling, a circumstance which renders it highly useful for culinary and other domestic purposes.

YEOVIL (CORPORATION) WATER-WORKS.—Mr. C. Hawksley attended the council meeting, on Monday, the 2nd inst., to describe the present condition of these works. He reported that the pond at the source was in excellent order. A few pipes had burst since the works were handed over. The council had been put to an expense of £15 from bad joints. At two-thirds of the hydrants the pitching required repair or actual relaying. He had had the reservoir emptied, and had examined it in every part. The floor and walls were good; there was no sign of any settlement, and the mortar had set very hard indeed. The quick round the reservoir had failed. The whole of the system was working most satisfactorily, and the revenue already obtained from the works was larger than might have been expected in so short a time. Great credit was due to the manager in this matter. The entire cost (exclusive of land, compensation, law, &c.) was £13,123—a sum very slightly in excess of the parliamentary estimate. On the motion of Alderman Whitby, it was resolved that a cheque be drawn for the balance of the engineers expenses, and that a vote of thanks be presented to Messrs. Hawksley for their zealous and efficient services.

GLASGOW (CORPORATION) GAS-WORKS.

SOIRÉE OF THE EMPLOYÉS.

The annual festival of the *employés* of the Corporation Gas Commissioners was held in the City Hall in the evening of the 3rd inst. The chair was occupied at the commencement of the proceedings by Bailie WALLS, and afterwards by Sir JAMES WATSON, the Lord Provost. Among the other gentlemen on the platform were Bailies Moir, Young, Collins, Craig, Morrison; Councillors William Miller, Findlay, Burt, Dron, Pinkerton, Lamberton, Brownlie, Waddell, Thomson, Moncur, Eadie, Torrens, Garvie, and Sharp; Rev. Dr. Brown, of St. Enoch's; Messrs. Wm. Foulis, manager; Alex. Ross, treasurer; Alex. Munro, clerk to the commissioners; Hugh Scott, James Lyon, James Alexander, John G. Christie, Stewart, &c.

The LORD PROVOST, who arrived shortly after the commencement of the proceedings, and was received with great enthusiasm, rose and thanked the audience for their hearty welcome. He could say, on behalf of the corporation, that they were most anxious that all in their employment should be comfortable and happy. He did not know that any person could be happier and more independent than a good tradesman. He was entitled to sell his labour to the best advantage, and all that was expected of him was that he should not molest his neighbour who might happen to be of a different opinion. Happiness was within the reach of every one of them; they had it very much in their own keeping; but it was sometimes marred by bad temper, by idleness, and by intemperance. He ventured to say they all knew the value of happiness as well as himself, and therefore it would be presumptuous in him to attempt to enlighten a body of men who were casting such a flood of light upon the city every evening.

Councillor WILLIAM MILLER afterwards delivered an address, in which he referred to the great improvements that had taken place in the gas-works, the commissioners having altered and improved the old stations and built a new one, which was, perhaps, the largest in the kingdom. Some people, he said, had been complaining of burning more gas than usual; but they forgot that the price was very much higher. Instead of being 4s., it was 5s. 5d. per 1000 feet. But whether the people had been burning a large quantity of gas or not, the commissioners were not making more than they did last year. It might be said that the Maryhill Company had come in and supplied the demand, but he learned from Mr. Foulis that they had fitted up double the number of meters that was taken from them by the Maryhill Company. In the portion of the year since the end of June last the increase in the quantity made was only 6½ per cent.—being not more than the natural increase which they ought to have every year. They had no inducement but to make gas as good as possible and as cheap as possible, for if they made any profit they would not know what to do with it.

Addresses were also delivered by Bailie MOIR and Councillor WADDELL.

The musical party consisted of Misses Bessie Aitken and Ruth Stanley, and Messrs. W. H. Darling and Wolfe Stuart. Mr. Lambeth played several pieces on the organ during the evening, and the pianoforte accompaniments were given by Carl Volti. At the close of the soirée dancing was engaged in for several hours.

LIVERPOOL (CORPORATION) WATER SUPPLY.

REJECTION OF THE WATER BILL.

The result of the polling upon the question of the water bill was announced on Wednesday last. The voting was for and against the following motion, which was rejected at a meeting of the ratepayers held on the 17th ult., in accordance with the provisions of the Borough Funds Act—"That this meeting consents to the promotion, by the mayor, aldermen, and burgesses of the borough of Liverpool, of the bill in Parliament, entitled 'A Bill to Enlarge the Powers of the Corporation of Liverpool in relation to Water Supply and Fittings, and otherwise to amend the Acts relating to the Liverpool Corporation Water-Works, and for other purposes.'"

Against the motion	34,424
For the motion	9,835
Majority against	24,589

The bill is therefore rejected.

CHESTER WATER-WORKS—PROPOSED SALE TO THE CORPORATION.—At the Chester Town Council on Wednesday last the General Purposes Committee reported that a communication had been received from the River Dee and Parliamentary Committee, stating that the chairman of the water-works company had made a proposal for the sale of the company's works to the corporation. The committee further reported that on the letter being submitted to them, they referred the same to a sub-committee to report upon it, and the committee laid before the meeting a report of the treasurer upon the offer of the company, prepared by him under the direction of the sub-committee, together with a resolution which they had passed, to the effect that, being of opinion that it was desirable in the interests of the city that the council should acquire the works if they could be secured on reasonable terms, the committee recommended that authority be given to them by this committee to enter into negotiations with the company for the purchase of the works, and to obtain such assistance for the purpose as they may deem necessary. The committee having considered the report and recommendation, it was ordered—"That the recommendation be agreed to, and that the River Dee, Parliamentary, and Water Supply Committee be authorized accordingly." The report was adopted.

ANALYSIS OF ANTHRACENE.—M. E. Luck has made, in the laboratory attached to the works of MM. Meister, Lucius, and Brüning, a series of researches to determine exactly the quantity of pure anthracene contained in the impure article. These researches were conducted according to the method of dealing with the anthracene under the form of anthraquinone. Anthracene is easily oxidized when it is treated in solution in acetic acid, with three or four times its weight of chromic acid, at the boiling point; but the anthraquinone is not susceptible of oxidation, even when the action of the boiling chromic acid is prolonged for several hours. The impurities, on the contrary, which accompany anthracene are readily transformed by prolonged boiling in acids and in alkaline solutions, and consequently they are readily separated from anthraquinone. M. Luck proposes, therefore, the following method:—About 1 gramme of anthracene is dissolved in 45 cubic centimètres of crystallizable acetic acid, and the solution is raised to the boiling point. This is then filtered, if necessary, and there is next added, very gently, a solution of 10 grammes of chromic acid, dissolved in 5 cubic centimètres of water and 5 cubic centimètres of acetic acid, taking care that the liquor shall not stop boiling. This is continued until the liquid attains a yellowish-green colour, and until a drop of the solution placed on a piece of pure silver causes the formation of a brownish-red spot (owing to the production of chromate of silver). After cooling, the solution is diluted with 150 cubic centimètres of water, and, after filtering for some hours, the resulting quinone is well washed with water, and subsequently with a very dilute solution of caustic potass, followed by careful washing with distilled water. The solid left is dried at a temperature of 100° C., and weighed. To compensate for loss caused by solution in 50 grammes of acetic acid and 150 cubic centimètres of water that have been employed, M. Luck states that it is necessary to add 0·01 gramme to attain the exact weight of the quantity that has been obtained. As the chromic acid of commerce frequently contains lead, it is better, in this case, to wash the precipitated anthraquinone with a solution of acetate of ammonia.—*Comptes Rendus de la Société Chimique de Berlin.*

CANNELITE.

This name has been applied to a carbonaceous mineral, occurring in King's, Albert, and Westmoreland counties, New Brunswick. Under the name of Baltimore and bituminous shales, it has been long known, and in connexion with Albertite has acquired considerable interest.

A few years since Professor H. Y. Hind and Professor Henry Würtz were engaged in a careful exploration of parts of these countries for minerals of economic value, and to determine the presence or absence of petroleum in reported localities.

The entire absence of bitumen in this mineral, its interest in a scientific connexion, and value as a source of hydrocarbons, led them to distinguish it from all other hydrocarbon minerals and name it Cannelite.

In geological position the mineral occurs in the lower Devonian rocks. Alternating beds of remarkable uniformity are shown at various sections, at Baizeley's Farm, on Tuille Creek, and at several points; the extreme length of area on one line exceeding 50 miles. They are shaly aggregates, containing carbon more or less diffused through them, but this mineral does not pass into them by gradations, and preserves its physical character and chemical composition quite evenly throughout its beds. With the slight diversity which is seen in coal samples from different parts of the same mine, it agrees.

Its colour is a shade of dark brown, fracture uneven, structure slightly lamellar. It is traversed everywhere by thin layers of Albertite. Often these are very thin and numerous in the thickness of an inch. When the layers are bent short the Albertite is most abundant in the ends, and, finally, perfect mirror-like surfaces may be obtained by splitting the mineral at its layers. The general aspect of this body is that of finely divided solidified mud, through which black brilliant gum has been disposed in layers. Specific gravity varies from 1·353 to 1·396. Breaks with difficulty. The samples analyzed were taken from spots miles apart, and the results represent the extremes of variation.

"The method pursued," says Professor Würtz, "I shall describe now in detail; the results are given as the basis of the economic value and fitness in application of this mineral to gas manufacturing.

"When heated this mineral crackles, gives off a slight odour of naphtha, with a little vapour of water. At a high temperature, vapour of naphtha, burning with a clear flame, followed by a denser oil, becoming smoky.

"The combustible matter burned off completely leaves a slight yellowish ash, occasionally dotted by darker spots. This ash is of the same composition as the sandstone in the closing beds. The unaltered mineral affords the same cementing salts as the sandstone rock, and may be taken as a mixture of the most finely divided silt of the rock, mixed with pulp of humus in water; subsequently cemented and consolidated under conditions favouring stratification. This fact has a scientific value.

"The Cannelite becomes dry at 420° to 440° Fahr. One hundred parts afforded

Water vapour 240° C.	1·00 ..	1·0 ..	1·0
Volatile inflammatory matter	42·90 ..	44·5 ..	41·5
Carbon in coke	17·70 ..	18·0 ..	20·0
Mineral matter	38·40 ..	36·5 ..	37·5
	100·00	100·0	100·0

"Viewed in the light these analyses afford, we have in Cannelite a congener of Torbane Hill mineral or Bogheadcoal, and as we are able to produce the hydrocarbon mineral of the Cannelite, mixed with and disposed in the silt of a sandstone, so we may suggest that the discussed Torbane Hill mineral is a more evenly mixed hydrocarbon mineral, with the silt of cannel coal—a fire-clay—without a trace of bitumen being present. Considered as representing Albert coal, Cannelite has a high economic value in the gas manufacture.

"Albertite and Boghead coal have been placed at the head of the list of enrichers of illuminating gas. As it is my purpose to show why we so rate these two bodies so highly at another time, I will confine my remarks to the practical point most prominent in this connexion.

"Albertite and Boghead coal in the 1000 tons are represented by

	Albertite.	Boghead Coal.
Moisture afforded at 200° C.	0·5 ..	1·50
Volatile inflammatory matter	60·0 ..	62·00
Carbon in coke	38·0 ..	12·00
Ash	1·5 ..	24·50
	100·00	100·00

"Both of these coals are paraffin-producing minerals, and hence the gas from them is charged with vapours which resist cooling well. We may, therefore, ascertain the comparative value of Cannelite, Albertite, and Boghead coal from their proportions of volume of inflammable matter afforded. Thus Boghead coal being 62·5, Cannelite has a value of 68·6 per cent. Both Cannelite and Boghead coal must be worked without mixture with coal; the gas formed from each being mixed, as produced with that of 'basis' coal.

"The present is a favourable time for substituting cheap basis coals for better gas coals, carrying the candle power of the gas higher, by the enricher used in a relatively small proportion.

"All the beds of Cannelite are near water transportation; the more distant ones can be opened to tramways having a descending grade to tidal rivers. The country is traversed by good roads and the population interested in developing their resources."—*American Gaslight Journal.*

ON THE ANALYSIS AND PURIFICATION OF WATER.

By Professor GUSTAV BISCHOF.

[Read before the Chemical Section of the Philosophical Society of Glasgow, Dec. 3, 1873.]

Considering the conflicting evidence we have at present regarding Frankland and Armstrong's method of water analysis,* it appeared to me desirable to test this method in several ways, in some of which it has not yet, as far as I am aware, been tested.

I divided the method into three stages—1. The measurement of the gases; 2. The combustion of the residue; 3. The evaporation of the water. The accuracy of each of these stages was tested separately, in order to ascertain to which stage any inaccuracies might be due.

1. Pure carbon, dioxide, and nitrogen were mixed at about the same ratio at which they occur in water. The mixture of gases was determined repeatedly, all the reagents being introduced into the laboratory vessel which are required for an analysis. Such quantities of carbon and nitrogen as occur in pure water could readily be measured to within 0·69 per cent. of the actual quantity present.

There was only one unaccountable exception to this rule amongst a large number of measurements. When measuring 0·76 C. C. of the mixture, I found 93·58 per cent. of carbon and 6·42 of nitrogen, instead of 89·02 carbon and 10·98 nitrogen. My first supposition, that this might be due to an absorption of the nitrogen, perhaps by an unusually large proportion of the reagents added, had to be abandoned; for, after leaving 0·08 C. C. of nitrogen in contact over night with a large excess of the reagents, its volume remained perfectly unaltered. I therefore feel strongly inclined to attribute the one incorrect result to an error in reading off the divisions of the measuring tubes.

However, I found that it is of consequence in measuring very small quantities of gas, whether the solution of the reagents be allowed to pass more or less into the horizontal thermometer tube connecting the laboratory vessel with the measuring tubes, and that it makes a considerable difference if the gas be passed in one instance to the right, and in another to the left side of the first stop-cock, especially if the bore of the thermometer tube does not remain equal throughout, but bulges out, which is sometimes the case in apparatus constructed without due care. As it is difficult to stop the inflow always at exactly the same place, a few graduations on the horizontal tube might allow for a correction in the case of very small volumes of gases.

In measuring gases resulting from combustions, carbon monoxide is, according to my experience, more frequently present than might be expected from Sutton's description, and I therefore always test for this gas.

The gas resulting from the combustion of the residue of evaporation of an impure water was next divided into several portions, which were unexceptionally determined with the greatest accuracy, as was evident from the relative proportion of carbon and nitrogen obtained.

A different and, in my opinion, more convenient pipette than that used by Dr. Frankland has been introduced by Dr. William Ramsay, one of my assistants, for transferring the liquid reagents into the laboratory vessel. This

FIG.1

½ Nat. Size.

consists of a glass tube of say 5 MM. internal diameter, drawn out into two capillary tubes 30 to 40 MM. distant from each other, as will be understood from fig. 1. One of the capillary tubes is bent round in the shape of letter U. If a liquid be sucked up through the straight capillary tube into the enlarged tube, and then the bent tube introduced into the inner side of the laboratory vessel, but above the level of the mercury in the trough, the liquid passes into the laboratory vessel. The smallest quantities may thus be passed in, as the inflow is at once stopped if the lower end of the pipette be depressed below the level of the mercury in the trough. The straight end of the pipette is conveniently passed through a cork, when it may be kept in the bottle containing the reagent.

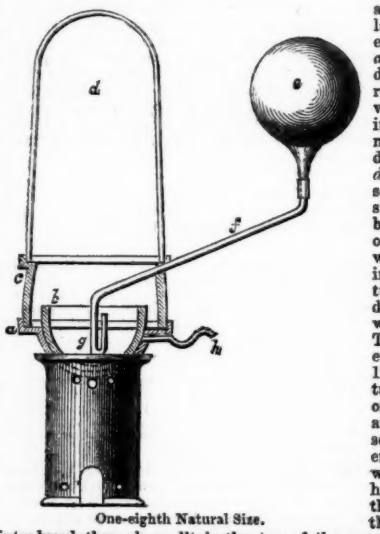
2. I make the copper spirals, which are used in the combustion tube, by winding evenly fine copper wire round a central wire, and I prefer having this, as also the copper oxide, tight in the combustion tube. As the latter might choke, I always let a drop of water fall on to the sealed end of the combustion tube after the combustion has been finished and the test tube containing the gas removed. The falling of the mercury in the delivery tube of the air-pump at once indicates if the combustion tube was not choked. However fine and tight the copper oxide, a choking takes place very rarely.

The experiments regarding the combustion of water residues were hitherto confined to dividing residues obtained by the evaporation of impure waters into several portions, which were separately burnt, the resulting gases being also separately measured. The results thus obtained were very close, showing that a remarkable conformity is obtainable by the combustion of like samples.

3. Like quantities of Loch Katrine water were evaporated under the same and under different conditions as to temperature, but always under the glass shades. The residues were burnt and measured separately. I think I may conclude, from the results thus obtained, that the temperature and the time allowed for evaporating the water is of consequence, inasmuch as a rather larger proportion of organic nitrogen is obtained, if the evaporation be finished in a comparatively short time—say, a litre in 18 to 20 hours—than if, at a lower temperature, five or six days be allowed. This might, perhaps, be due to a fermentation setting in and altering the nitrogenous organic matter. The sulphurous acid, which acts as an antiseptic, is, in Dr. Frankland's and also in my laboratory, only added to the contents of the flask in which the sample is boiled and kept, but not to the contents of the evaporating dish. Hence, if the contents of the dish be repeatedly exposed for a long time to a temperature of say 50° to 60° C., the sulphurous acid may be driven off, and fermentation set in during part of that time.

However this may be, it appeared to me desirable to accelerate the evaporation as much as possible, and to render the gradual addition of new portions of the sample to be evaported self-acting. I had further in view that the evaporation should be finished more uniformly as to time than hitherto attainable in my laboratory, and that the whole arrangement should be more easily accessible to all chemists than the arrangement which is at present in use at the Rivers Commission laboratory in London. To this end I place on to the copper dish, *a a* (fig. 2), in which the glass dish, *b b*, is heated, a copper ring, *c c*, 80 MM. high, provided on its top with a slightly inclined rim of the same diameter as that of the copper dish, so that the glass shade, *d*, may rest on either. The self-filtering apparatus consists of a flask, *e*, with rounded bottom, of rather more than one litre capacity, the neck of which is ground so accurately into the enlarged end of a glass tube, *f*, of about 8 MM. internal diameter, as to be water-tight without the use of grease. The tube close to the enlarged end is bent at an angle of about 120°. The other end of the tube, which is formed by one of the usual self-filtering arrangements, *g*, is again bent so as to be parallel with the enlarged end of the tube. The water and sulphurous acid having been introduced into the flask, the tube is attached, the apparatus inverted and introduced through a slit in the top of the copper ring into the glass dish, without, however, touching its bottom. The slit should be so deep that the glass shade does not quite touch the glass tube.

FIG.2



One-eighth Natural Size.

I employ glass dishes of 150 MM. diameter. When the litre flask is nearly empty, the copper ring and self-filtering apparatus are taken off, after allowing the last portions of water to run into the glass dish, and the glass cover is placed directly on the copper dish. The copper dish, which rests on a Griffin's gas furnace, is heated by means of a Bunsen burner, the temperature being regulated by the Bunsen-Kemp gas-regulator, as modified by me (Fresenius, *Zeitschrift*, x., p. 442). The copper dish is half filled with pure distilled water, and the temperature so regulated that the water is kept in a state of very gentle ebullition, the excess of the condensed water running off through a syphon-tube, *h*, attached to the copper dish. The evaporation of a litre of water may by these means easily be finished in 16 to 18 hours.

The next questions to which my attention will be directed are—the action of any free acid formed during the evaporation on organic matter, the elimination of nitrates and nitrites during the evaporation, and whether the results are reliable when determining the minute quantities of organic impurities which occur in comparatively pure waters. Other questions will probably suggest themselves in the course of these experiments. As water analysis is such a very

* For a complete description of the apparatus employed, see T. E. Thorpe, "Quantitative Chemical Analysis," p. 305· or F. Sutton, "Volumetric Analysis," p. 264.

important branch of our laboratory work, I hope I shall be permitted to lay the results arrived at before the society at some future meeting.

In conclusion, one of the spongy iron water filters, referred to at page 370 of the Proceedings, 1872-73, was exhibited and explained. One of these filters has now been in constant action in London for three and a half months, filtering the water supplied by the Chelsea Water Company. The analytical results show that the purifying action of the spongy iron has not in the least been decreased during that time, and the hardness of the water is still reduced to nearly one-half. This experiment is being continued; but it may be pointed out that animal charcoal, probably the best filtering material hitherto known, frequently shows signs of decomposition after three months use, and then contaminates the water. The purifying action of spongy iron appears, therefore, to be also, in this respect, superior to that of animal charcoal.

THE SOUTHWARK AND VAUXHALL WATER COMPANY'S NEW WORKS AT NUNHEAD.

For more than two years past new works of great magnitude have been in course of construction for the Southwark and Vauxhall Water-Works Company. They include four immense reservoirs situated on the high ground at Nunhead, together with a spacious engine-house, containing powerful direct-acting engines, and four boilers, each 30 feet in length by 6 feet in diameter. The engines and boilers are being supplied by Messrs. Harvey and Co., of Hayle, in Cornwall. The works also embrace the laying of no less than 15 miles of main-pipes, 3 feet in diameter, in order to connect the new reservoirs at Nunhead with the company's intake on the banks of the Thames, near Teddington Lock. These mains have been laid by Messrs. Aird and Son, of Belvedere Road, Lambeth, who have also executed some of the heaviest portions of the work in connexion with the construction of the reservoirs. The new mains from the neighbourhood of the company's intake, are carried under and along several main thoroughfares in a north-easterly direction, and after being carried for a considerable distance through the Wandsworth and Clapham Roads, are thence continued along Acre Lane, crossing Brixton Road, into Coldharbour Lane, passing along its entire length to Camberwell, at the foot of Denmark Hill, just above High Street.

We have already stated that the reservoirs are four in number, and it may be added that, together with the engine-house and other buildings, they cover an area of upwards of 14 acres. They are constructed on different levels, two on the high level and two on the low level. The high-level reservoirs are 4 acres in extent, with a storeage capacity of 6 million gallons of water; whilst the the area covered by the low-level reservoirs is double that of the others—namely, 8 acres, and equal to a storeage of 12 million gallons, the aggregate capacity of the four reservoirs being 18 million gallons, thus giving some conception of their enormous extent. The engine-house and other buildings, noticed below, have been erected on a plot of ground situated between the higher and lower reservoirs. The extreme depth of each reservoir is 20 feet, and the floors are made perfectly water-tight by a surface of concrete and puddle 12 inches in thickness. The embankments of the reservoirs are built in terraces, each 16 feet wide, with a slope between each equal to the width of two. They are faced and made dry with red ballast, and drained with pipes. All the reservoirs are firmly covered in with the view of securing the water from the action of the weather and atmospheric impurities, and on the outer surface above, a turf will be laid down, which will answer the double purpose of still further promoting the purity of the water, and also rendering the area above capable of being utilized for grazing purposes, or ornamentally laid out. The coverings or roofings are supported by brick arches springing from piers, the space above and between the arches being filled in with puddle and soil. Each reservoir has one inlet, together with an over-flow-pipe of 30 inches in diameter, and in the construction of the works a system of valves has been introduced, which will admit of the whole of the reservoirs being quickly run dry, even should they be fully charged with water. The good quality of the water is further provided for by gravel and sand filtering-beds, through which the water will pass in its course from the inlet to Nunhead.

The engine-house, situated between the lower and the higher reservoirs, is already built. It has a water tower, 70 feet in height, prominent for several miles around. The materials used in the structure are white Suffolk brick, with stone and red brick dressings. Almost immediately adjoining the engine-house is the manager's residence.

The whole of the works are now fast approaching completion, and it is confidently expected that all will be in readiness for commencing the supply in the course of the ensuing summer. The laying of the great mains, already referred to, which has been a heavy portion of the undertaking, has just been completed, and the reservoirs themselves are now almost finished; whilst the boilers have also been fixed in the engine-house, and the engines themselves are expected to arrive in the course of a few weeks. The estimated cost of the works, exclusive of the value of the land, is about £220,000.

The works were designed by Mr. Just, C.E., in conjunction with Messrs. Joseph Quick and Son, who have carried out the undertaking, assisted by Messrs. Aird and Son, as contractors for the building portion of the work.—*Builder*.

Lighting of Windsor Castle.—We read in the account of the state banquet in honour of the Duke and Duchess of Edinburgh, that the Waterloo gallery is lit by handsome sunlights in the roof. These and other alterations, which make the gallery the fine room it now is, are due to the good taste of the Prince Consort. They were made shortly before his death by Messrs. F. and C. Osler, of Birmingham and Oxford Street, London—so shortly, indeed, that when the room was lit up for the Prince to see the effect, he sent word to the Master of the Household that he was not very well, and would not come that day. So the sunlights were turned out again, and the Prince never saw them lit, for his feverish cold never mended, but changed to the sickness of which he died.

Richmond (Yorkshire) Corporation Gas-Works.—At a meeting of the Richmond Town Council, on Wednesday last, the Gas Committee reported that application had been made to the Court of Chancery, and permission obtained for the transfer of the garden-ground situated near the gas-works from the trustees of Mr. G. Harrison to the council. The committee had selected from the several tenders received for the erection of a new gasholder, 60 feet by 16 feet, on the piece of ground referred to, one from Messrs. Holmes and Co., of Huddersfield. There had been a loss of £15 13s. 10d. from the gas-works during the year ending the 30th of June, and the committee, therefore, reluctantly recommended that the price of gas be raised from 5s. to 5s. 10d. per 1000 feet, to commence from the 1st of April. The report was adopted.

Purchase of the Shipley Gas Company's Pipes by the Corporation of Bradford.—At the meeting of the Bradford Town Council on the 10th inst., Alderman Scott moved a resolution accepting the offer of the Shipley Gaslight Company to sell to the corporation, for the sum of £1800, the whole of their gas-pipes, including all claims in respect of the company's interest in the gas supply of the township of Bolton. He said that the purchase was incumbent on the corporation, or it would not have been made, as he did not believe that Bolton would be of much advantage to the corporation as manufacturers of gas. He was not then prepared to state the terms of the agreement, as they had not been able to come to a satisfactory agreement with the Eccleshill and Idle Gas Company, whose interest in the township of Bolton the corporation had to purchase, and which it was probable would have to be referred to Mr. Hawksley as arbitrator, to fix the amount that should be paid. Alderman Shepherd seconded the motion, which was carried.

DR. ODLING ON THE IMPORTANCE OF INDUSTRIAL CHEMISTRY.

At the opening meeting of the Chemical Section of the Society of Arts, on Friday, March 6, Dr. Odling presided, and commenced the proceedings by delivering the following address:—

I have been desired by the council to say a few words, at this introductory meeting, on the importance of industrial chemistry; but really to do so is to urge upon you a theme which requires no advocacy, I should think, on the part of any one, and I am afraid it would be as tedious as a thrice-told tale. If we look at the objects with which we are surrounded, and consider how very few of them are in the state in which they are presented to us by nature, we shall find that the metamorphoses to which they have been subjected are essentially chemical ones; that is to say, wherever we find one kind of matter in nature, and somehow or other the matter is turned into another kind of matter, it has undergone a chemical change; and how very few indeed of the different kinds of matter with which we are surrounded are really in their primitive forms. When we have mentioned coal, wood, and stone—mean building stone—we have mentioned almost all. When we consider the gas which, though now gas, was a short time ago in the form of coal; or the glass of our windows, which a short time back was in the form of sand, soda, and limestone; or if we look at the plaster of our rooms, which was originally limestone, but has undergone varied metamorphoses—and more particularly I might direct your attention to the metallurgical industries, especially iron, which was a short time before in the ironstone—all these are instances of the chemical metamorphoses to which we subject the different natural objects, and so change one kind of matter into another. Among all these metamorphoses which are of a chemical nature, there are some to which we more particularly apply the name of chemical manufactures. In reality, a brick is a true chemical product; it was not originally the same matter it now is, but was produced by a change of chemical composition of its elements. But among these more particularly called chemical manufactures, the production of which is conducted in works which are called chemical works, are those performed in so-called alkali works; and I think I need have no hesitation in saying that these works have proceeded to a far greater development in this country than in any other, notwithstanding the fact that among the constituents received and metamorphosed by these works are many which are of foreign extraction, more particularly the pyrites, or other sources of sulphur, and the manganese or other indirect source of the chlorine manufactured at these works. And we see that, in the course of lectures which have been provided for us, three have reference especially to the manufactures which are conducted exclusively at works which are denominated chemical works. We have a process for the manufacture of soda by Mr. Vincent; another on pyrites, as a source of sulphur, copper, and iron, by Dr. Wright; and another on the manufacture of chlorine, by Mr. Weldon. Starting from the crude substances, coal and limestone, and pyrites and common salt, we have a production of soda which will be treated of more particularly in Mr. Vincent's address. Then we have the further manufacture of copper, sulphur, iron, and chlorine, which are the necessary economical concomitants. It is indeed remarkable, at the present day, how much the progress of chemical manufactures consists in the working up of what were formerly waste products. Perhaps we could not have a more singular instance of this than in the utilization to which that class of refuse, which was formerly known as burnt pyrites, is now put. Not only do we obtain from the original pyrites much sulphur which was formerly thrown away on a very large scale, but, moreover, copper and iron, which was also formerly thrown away in the burnt pyrites. And we have also one very remarkable product now obtained from pyrites on a comparatively large scale; and I may say, with regard to the manufacture of copper from pyrites, that the amount now produced—as Mr. Wright will tell you—from a material which was formerly thrown away, constitutes a large proportion of the entire quantity now manufactured in the United Kingdom. But in addition to that there is a very considerable manufacture of silver now going on also extracted from these waste pyrites. This extraction of silver from these pyrites, in which it occurs in an exceedingly minute proportion, has an essential interest for chemists in this point of view, that the processes which are adopted for its extraction really resemble most closely the processes which purely scientific chemists adopt in the laboratory. The pyrites is first of all heated with common salt, whereby the copper is converted into chloride of copper soluble in water, and the silver into the state of chloride of silver, which is soluble in the common salt solution; and not only so, but in this process of removing the soluble copper and and the soluble silver from these pyrites, the arsenic and the sulphur, which formerly prevented the burnt pyrites being put to any use, are got rid of, so that what remains is useful in a further stage of the iron manufacture. But with regard to the extraction of the silver, we find how important a knowledge of even delicate chemical processes is, in order to allow the extraction to be pursued with advantage. By the ingenious process of Mr. Claudet and Mr. Phillips, the solution is first of all examined by the nicest chemical means to see the exact amount of silver it contains by a process rivalling in delicacy that which is pursued in laboratory research, and having ascertained exactly the quantity of silver contained in the solution, the exact quantity of that expensive re-agent, iodide of potassium, which is required, is added to it to precipitate the amount of silver; and when the iodide of silver is thrown down the iodine is recovered to be used over and over again, and the silver itself is set free by means of metallic zinc, which forms iodide of zinc, thus setting free the silver. In this way a considerable portion of silver is extracted. I mention this as an illustration of the remarkably close association which is every day taking place between pure chemistry in the laboratory and manufacturing chemistry in the factory. Now-a-days we have such out-of-the-way bodies, as they were formerly considered, as these different aniline products, as alizarine and chloral, which were formerly barely procurable in the laboratory, now made on a manufacturing scale. On the other hand, we find these different processes of estimation, formerly confined to the laboratory, are now carried on in the manufactory, and thereby such an element as silver is produced by processes which are essentially laboratory processes. In this way it happens that we find many improvements in manufacturing chemistry are now produced by men who have obtained a reputation in other fields. For instance, I need scarcely refer to the names of Hofmann, Perkin, and Nicholson, gentlemen known as scientific chemists and of the highest eminence before their attention was directed to manufacturing operations, and they realize on a manufacturing scale the results of their laboratory experience. In mentioning them, I ought not certainly to dissociate from them our lecturer this evening, Mr. Field, who was so long and so highly esteemed in purely scientific circles for his admirable researches into a great number of compounds, more especially connected with mineral chemistry, before he devoted his great ability to the elucidation and improvement of the manufacture of aniline dyes, and subsequently to the metamorphoses of the bodies which we now use for illuminating purposes in the form of paraffin and ozokerit, and similar bodies.

But while in this way many manufactures derive a very great advantage from the light thrown on it by purely scientific chemists in one way or another, I do not think we ought to overlook the benefit which pure chemistry derives, on the other hand, from manufacturing operations. I do not mean the mere material gain that purely scientific chemists have enjoyed by the opportunity of examining minutely a great number of bodies, which previously it was almost impossible for them to obtain; but I think they have gained a very much greater knowledge of the especial subject of their studies—I mean chemical phenomena. We chemists take as our province every change by

which one kind of matter becomes metamorphosed into another kind of matter, whereby that which was ironstone, for instance, becomes iron; whereby that which was sand, chalk, and soda becomes glass; and which takes place wherever one kind of matter is metamorphosed into another. But, after all, a great number of the metamorphoses which we must study take place in the test tube, and small vessels of similar character; and we are rather too apt, I say, to shut our eyes to those metamorphoses which take place on a large scale around us. Those changes manifest themselves particularly in two forms. We have those by which the different forms of agricultural produce are furnished us by the vegetable kingdom, and by which they are metamorphosed into the animal kingdom. Here we have one great illustration of industrial chemistry—the chemistry by which crops are produced, and by which stock is fed and flesh is made. This feeding of stock and production of crops is one very large function of industrial chemistry; and I would venture to say that any scientific chemist who devotes his attention entirely to what takes place in the test tube, and who neglects those changes which are constantly taking place around him, has a very imperfect notion of the subjects which he professes to investigate. And, in addition to these changes thus taking place in natural processes, modified to a certain extent by art, we have three other processes which take place on a grand scale, by which, from such substances as ironstone, we produce metallic iron; from common salt, on the one hand, carbonate of soda, which is applied to the manufacture of glass and other useful purposes; and by which we provide, also, chlorine in its different combinations, which we apply to so many purposes, more particularly in the preparation of our wearing apparel, and in our linen and fabrics of every description. I think, then, that when we have the advantage of having these industrial subjects brought under our notice by men like our friend here,* who are familiar, on the one hand, with the most recondite points of theoretical chemistry, and, on the other hand, with the greatest practical achievements which have been obtained in manufacturing chemistry, it will be of immense benefit to those who wish to study chemistry in its pure aspect, as they will see what can be done on a large scale, and what habitually is done, and what perseverance, assisted by chemical knowledge, has obtained for us. And, on the other hand, it must be interesting to practical men, by throwing out suggestions capable of improvement in various branches of manufacturing art. I think, then, that the Society of Arts has really done a very useful work in bringing together men engaged in the purely scientific pursuit of chemistry, on the one hand, and, on the other, men who are pursuing the application of the science with a view to the practical good of their kind. I do not know that I need trouble you with any further remarks, but I have attended here this evening with the greatest pleasure, because I feel how much advantage is likely to be derived by all classes of the community by the discussion of these problems which are so interesting to all, and I would venture to say as much in a purely scientific as in a practical point of view.

THE NORTHERN COAL TRADE.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the northern district is not in a very satisfactory position. In the steam coal districts the owners of first-class collieries decline to reduce their official quotations below 20s. per ton, less 2½ discount, whereas collieries that are supposed not to be bound by these rules are doing a scrambling, irregular business, at quotations ranging from 15s. 6d. to 16s. per ton. These, of course, are called second class. The season has commenced when a large business should be transacted in steam coals; but in consequence of the unyielding attitude assumed by the owners of first-class steam collieries, few new orders are coming to them, and where they cannot be withheld, foreign merchants are sending them to Scotland, where a cheaper class of coals can be bought. There is a general impression, however, upon Newcastle Quayside, that owners of first-class steam collieries cannot uphold their prices much longer without greatly damaging the prospects of their trade for the year. These observations also apply to the gas coal trade. Many of the large collieries in the trade have heavy contracts on hand which they made at rates ranging from 16s. to 17s. per ton. They are not, therefore, disposed to go into the open market to sell under these prices, but second-class gas coals are offered at from 12s. 6d. to 14s. per ton. Household coals are dull. When the cold weather set in in the early part of last week, a little briskness was shown in sending coals away to the London market; but with the change of weather, on Friday, business relapsed to its old condition of stagnancy. All kinds of manufacturing coals continue to be abundant, and where shipments are made to the Continent, they are at very much lower rates than when the season closed last year. There is little doing in the iron trade, and prices generally tend downwards. With regard to freights in the foreign and coastwise, the general course of business is favourable to shippers. On Friday coal rates did not exceed £7 to £7 10s. per keel for the English Channel ports, and £8 to £8 5s. for France, with 6s. 3d. per ton London, to discharge at the wharves. The chemical trade of the North of England is unchanged. Few shipments are made for New York, and no great amount of business is being transacted with the German ports, which are now open. Steam and gas coals are being shipped to South America, but not in large quantities.

OLDHAM (CORPORATION) GAS-WORKS.—Mr. John Chadwick, formerly assistant-manager at these works, has just been appointed to succeed the late Mr. Taylor as manager; and Mr. R. Cawley has been appointed assistant gas manager at the Hollinwood station of the corporation.

UNITED GENERAL GAS COMPANY.—A meeting of this company was held at the London offices, on Tuesday, March 10. From the report presented, it appeared that the profit for the year, with £98 brought forward, was £1319, out of which a dividend of 2s. 6d. per share was declared, free of income-tax, leaving £194 to be carried to next account.

WATER SUPPLY OF JERUSALEM.—According to a local paper, a rich English lady is about to cause the construction, at her own cost, of a handsome aqueduct for the purpose of providing the city of Jerusalem with a good supply of water, which, in common with Constantinople, it much needs. The scheme will involve an outlay of £25,000, and an engineer is now engaged upon the plans, which will be submitted to the Porte when they are completed, in order to obtain its authority for the execution of the project. The *Levant Herald* remarks: "We hope the story may be true, though we have read nothing of it in the English papers nor heard anything of it here."

Register of New Patents.

2177.—HUNTER, A. G., Flint, North Wales, "*Improvements in apparatus for the manufacture of gas for illuminating and heating purposes.*" A communication. Patent dated June 21, 1873.

This invention relates to improved apparatus for making what is known as air gas by charging or impregnating atmospheric air with the vapours of a liquid hydrocarbon, such as gasoline, and consists in improvements in the carburetter, and in such a disposition of the apparatus that the carburetter will be maintained at a comparatively uniform temperature, and the evaporation of the fluid will therefore be less affected by external changes.

The carburetter, or vessel in which the air is brought into contact with the liquid hydrocarbon, is contained within a cistern of water (or it may be oil), and the whole buried in the ground to a depth of several feet, and at a suitable distance from the building to be lighted. The pump or apparatus by which atmospheric air is drawn or forced through the carburetter may be located within the building to be lighted. By this means the warmth of the earth is imparted to the body of water surrounding the carburetter, thus keeping its temperature comparatively uniform, and making the quality of the gas produced less dependent on atmospheric changes, enabling it to attain and retain its full illuminating power at all seasons of the year. The heat abstracted by the carburetter from the surrounding jacket of water whilst the evaporation of the gasoline is going on is restored to the water from the surrounding earth.

The carburetter consists of a metallic vessel, in which a fibrous material, such as cotton cloth, cotton, or woollen flannel, is so disposed as to form a circuitous or tortuous passage for the air to travel in and to come in contact with the liquid hydrocarbon, which rises in the fabric by capillary attraction. The fabric is thus kept saturated, and offers a very extended surface for evaporation. The fabric is disposed edgewise, and reaches from top to bottom of the vessel, in which it is arranged in a coil, zig-zag or otherwise, with a space between the several coils to form one continuous passage for the air. The fabric may be fastened on vertical pins, fixed by their upper ends to a wooden lining, with which the top of the chamber is provided, and to which the upper edge of the fabric is closely attached.

The carburetter consists of a single chamber only, but by preference it is divided into two distinct chambers by a horizontal partition, in both of which the fibrous material is similarly arranged, but so that the passage through the one chamber—say, the upper one—shall form a continuation of that through the lower one, into which the air first passes, and having traversed the whole of the passages therein, enters the other chamber, through which it also passes, and is conveyed where required. The carburetter, or each chamber, if there be two, is nearly filled with liquid hydrocarbon, and a pipe from the carburetter reaches to the surface of the ground, through which the vessel is filled, means being provided to indicate when it is sufficiently supplied. The lower chamber may be supplied from the upper by means of an overflow-pipe, or each chamber may be filled by a separate pipe. Suitable inlet and outlet pipes are provided for the air and air gas, also pipes leading from the carburetter to the surface of the ground to enable it to be cleaned out if requisite.

2209.—IMRAY, J., Southampton Buildings, London, "*Improvements in modules or apparatus for regulating and measuring the delivery of water or other liquids.*" A communication. Patent dated June 25, 1873.

This invention relates to modules for regulating or rendering uniform the delivery of water or other liquids, and to meters combined therewith. The module consists of a supply-box floated to a regulated immersion in the head of liquid, which enters it through a hole in its side, and flows from it by a pipe jointed to the box and a discharge-pipe, which is jointed to the discharge orifice. The position of the latter pipe is governed by floats, and the former pipe is balanced on it, or nearly so, and thus the immersion of the supply-box being unaffected by variations in level, the quantity of liquid delivered in a given time is rendered nearly uniform. A paddle-wheel is mounted on the supply-box, and connected by gearing to indices, which show as a meter the amount of liquid delivered.

2235.—BOUSFIELD, G. T., Sutton, Surrey, "*Improvements in lamps to be used for cooking, heating, and lighting purposes.*" A communication. Patent dated June 27, 1873.

The object of this invention is to supply oxygen direct to the flame of a lamp sufficient in quantity to cause the complete combustion of all the obnoxious gases usually thrown off, thus producing a brighter light for illuminating purposes, and rendering the flame so pure that the most delicate meat can be cooked over it without being tainted in the slightest degree. A stand and cover or chimney is also employed for the flame, by which the cooking utensils can be held over the flame, while, at the same time, full benefit from the lamp as an illuminator is secured.

2245.—GRAHAM, D. A., Gas-Works, Stalybridge, "*Improvements in the manufacture of gas, and in the apparatus employed therein.*" Provisional protection only obtained. Dated June 28, 1873.

The first part of this invention consists in distilling coal in the ordinary manner, passing the gas through horizontal condensers, and conveying the tar into stills or boilers where the naphtha or other illuminants in the tar are converted into vapour or permanent gas. These stills or boilers may also be used to distil any other suitable liquid or substance for the same purpose. In a separate boiler, steam is generated and decomposed by passing it through a red-hot tube filled with iron borings, or any of the well-known means may be employed for obtaining hydrogen. The hydrogen is then mixed in appropriate chambers, with the gases formed in the stills in suitable proportion, together with such a quantity of the ordinary coal gas as is found most advantageous. The mixture is then exploded by passing an electric spark or sparks through it, thereby converting the contents of the chambers into a permanent gas of considerably greater volume than the original constituents. Moreover, by this process the bisulphide of carbon is converted into sulphuretted hydrogen, which can be easily removed by the ordinary oxide of iron purification.

The second part of the invention relates to a peculiar arrangement of valves or other mechanism, whereby the gas in the explosion-chamber is entirely and safely isolated from the gas being made and the gas being forced on for purification or storeage.

The advantages attending the process are a greater amount of purity, a larger return of gas per ton of coal, and of higher illuminating power, besides the tar being converted into pitch suitable for sale.

2247.—CARTER, J., and CARTER, J. E., Halifax, "*Improvements in the manufacture of water or stench traps.*" Patent dated June 28, 1873.

This invention consists in improvements in the construction of water or stench traps, whereby not only a saving of space, but also a considerable economy of material is effected, whilst the trap itself is made stronger than heretofore, and is much less liable to be injured or affected by accidental strain or pressure on the main pipes connected with it.

According to this invention, the inlet and outlet pipes are brought much closer together, and form the trap part by means of two projecting pieces or partitions extending forward into the trap, one from the inlet and the other from the outlet pipe, so as to hold between them a sufficient quantity of water to effectually cut off all air communication between the two sides of the trap without in any way interfering with the free passage of the water, and having no greater liability to choke with dirt or other matters than ordinary traps having pipes of a similar size.

According to one arrangement, the trap part is made larger than the body of the pipe, and the projecting pieces or partitions extend forward into the trap from the inlet and outlet pipes, or the trap may be made somewhat similar in its outward form to the ordinary S-trap, but instead of the bent part being in the shape of one continuous tube, the inside passage of which is of the same shape and size in cross section from end to end, the trap is made much shorter and quicker by means of the projecting pieces or partitions.

If desired, the outlet-pipe may be made at right or any other angle with the inlet-pipe. In each case the traps are cast in lead, and all in one piece, and generally with plug-holes, and, preferably, cores of metal are used, made up in parts, and capable of being readily put together and taken apart, and removed from the trap after it is cast, the plug-holes facilitating the insertion and removal of the cores. The passages through taps are at least equal in area to those of the inlet or outlet pipes.

* Mr. Frederick Field, F.R.S., who subsequently read a paper "On the Paraffin Industry."

APPLICATIONS FOR LETTERS PATENT.

839.—Willoughby, J., Plymouth, Southwell, W. A., and Briggs, T. J., Palmerston Buildings, London, and Willoughby, S., Plymouth, "Improvements in apparatus for distilling tar and the products thereof," March 7, 1874.
840.—Cook, H. W., Brompton, Middlesex, "Improved apparatus for forcing or pumping water, air, or gas, or other liquids or fluids." March 7, 1874.
848.—Goodall, R., Armley, near Leeds, "Improvements in the means or method of purifying foul water or sewage, and in the apparatus employed in connexion therewith." March 7, 1874.
864.—Warner, W. J., Gas-Works, South Shields, "Improvements in the arrangement of gas-retorts and their appliances, together with apparatus and machinery for charging and discharging them." March 10, 1874.
873.—Newton, A. V., Chancery Lane, London, "An improvement in pumps." A communication. March 10, 1874.
874.—Tandy, G. G., Penge, Surrey, "Improvements applicable to street-lamps." March 10, 1874.
897.—Bayley, H. D., and Bayley, G. H., Leek, Staffs, "Improvements in the construction of taps or valves, which improvements are also applicable to the fixing of glass tubes in water-gauges." March 12, 1874.

GRANTS OF PROVISIONAL PROTECTION.

662.—West, D. K., Kentish Town, Middlesex, "Improvements in engines to be driven by water and steam, and in pumps." Feb. 21, 1874.
697.—Braidwood, J. F., Phœnix Gas-Works, Bankside, London, "Improvements in apparatus for securing the lids or covers of gas and other retorts." Feb. 24, 1874.
702.—Weston, J. H., Lansdowne Road, Surrey, "Improved means of and apparatus for purifying, carburetting, and increasing the illuminating power of coal gas." Feb. 24, 1874.
717.—Robinson, A. H., Merrion, Dublin, "Improvements in meters for measuring water and other liquids, and in motive-power engines, parts of such improvements being also applicable to flushing water-closets and preventing waste of water." Feb. 25, 1874.
720.—Woodcock, J., Plymouth, "Improvements in valves for regulating the supply of water to cisterns or tanks." Feb. 25, 1874.
733.—Somerville, J., Dublin, "Improvements in the method of manufacturing gas for lighting and heating, and for the apparatus used therein." Feb. 27, 1874.
734.—Hughes, N. H., Ayr, N.B., "A new or improved self-registering fluid or liquid measurer." Feb. 27, 1874.
766.—Beck, W. H., Cannon Street, London, "Improvements in the manufacture of illuminating gas, and in apparatus employed therein." March 2, 1874.
768.—Landau, M. I., St. Mary Axe, London, "Improvements in lamps, also in burners, and in applying lamps for various purposes, and in apparatus for supplying and regulating gas, and for ventilating." March 3, 1874.
793.—Cooke, J., and Myhill, W. H., Birmingham, "Improvements in cocks or taps for high or low pressure." March 4, 1874.
800.—Forbes, Rev. G. H., Broughton, Northampton, "A new or improved compound for use as fuel, or for the manufacture of gas for heating and illuminating purposes, capable also of being used in the production of a material suitable for the purification of gas." March 4, 1874.
810.—Weston, J. H., Lansdowne Road, Surrey, "Improved means and apparatus for increasing the illuminating power of gas in lamps and other mediums of lighting, portable and otherwise." March 5, 1874.
813.—Goold, G., Birmingham, "Improvements in cocks or valves for regulating the flow of liquids." March 5, 1874.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

815.—Haseltine, G., Southampton Buildings, London, "Improvements in dry gas-meters." A communication. March 5, 1874.

NOTICES TO PROCEED.

3526.—Harrison, C. W., High Holborn, London, "Improvements in the manufacture of gas, and in the apparatus employed therein." Oct. 30, 1873.
3555.—Gerckr, K. L. H., Berlin, "Improvements in apparatus for regulating the flow of gas or other fluids." A communication. Nov. 1, 1873.
3628.—Nuttall, F. D., St. Helen's, Lancs, "An improved arrangement of gas-box and reversing gear, applicable to Siemens's regenerative gas-furnaces." Nov. 7, 1873.
3636.—Darlington, F. A., St. Helen's Place, and Scott, F., Portland Place, London, "Improvements in machinery for charging and discharging gas-retorts." Nov. 8, 1873.
2712.—Tongue, J. G., Southampton Buildings, London, "Improvements in water or other fluid meters." A communication. Nov. 14, 1873.
629.—Leoni, S., New North Road, London, "Improvements in heating and cooking apparatus." Feb. 19, 1874.
679.—Lake, W. R., Southampton Buildings, London, "Improvements in air-tight joints for gas-retorts." A communication. Feb. 23, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3086.—Fottrell, J., Dublin, "An improved composition for the manufacture of pipes and tubes suitable for water at high pressure, and as conduits for sewage purposes, gas, and other liquors." Sept. 20, 1873.
3110.—Forbes, Rev. G. H., Broughton, Northampton, "Improvements in the manufacture of compounds to be used as fuel." Sept. 23, 1873.
4172.—Akester, J. C., Hull, "An improved silica gas-stove." Dec. 19, 1873.
4178.—Spice, R. P., Parliament Street, Westminster, "Improvements in apparatus used in the manufacture of gas." Dec. 19, 1873.
28.—Forbes, Rev. G. H., Broughton, Northampton, "A new or improved compound to be used as fuel," Jan. 2, 1874.
207.—Huerne, P., San Francisco, California, "An improved self-cleaning water-filter and connexions, whereby water may be filtered for household purposes and stored in quantity so as to be used at pleasure." Jan. 16, 1874.
232.—Forbes, Rev. G. H., Broughton, Northampton, "Improvements in the purification of gas." Jan. 17, 1874.
261.—Lake, W. R., Southampton Buildings, London, "Improvements in lamps." A communication. Jan. 21, 1874.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

461.—Slater, B., "Improvements in apparatus for regulating the turning of gas, water, or other cocks." Feb. 22, 1871.
472.—Haseltine, G., "Improvements in apparatus for carburetting atmospheric air." Feb. 22, 1871.
475.—Haseltine, G., "Improvements in gas-burners." Feb. 23, 1871.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

560.—Allen, S. B., and Winsor, J. H., "Improvements in generating heat by the admixture and combustion of a hydrocarbon vapour, air, and the gaseous components of steam." Feb. 28, 1867.

Share List,
OF
Metropolitan Gas and Water Companies.

(*Corrected by Mr.* F. N. Golding, *Sun Court, Cornhill, from the latest Stock Exchange Quotations.*)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£	GAS COMPANIES.	£ s. d.	£ s. d.	£
8000	20	Anglo-Romano	20 0 0	10 0 0	14 — 16
5000	20	Bahia (Limited)	20 0 0	3 0 0	11 — 13
1000	20	Do., preference	20 0 0	10 0 0	25 — 27
750	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	6 15 0	5⅞ — 6¼
10000	5	Do., fourth issue	4 0 0	6 15 0	⅜—1 pm.
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge., and Holywell.)	20 0 0	10 0 0	34 — 36
7500	20	Cagliari (Limited)	20 0 0	7 0 0	15 — 17
180000	10	*Chartered* A ordinary	10 0 0	10 0 0	15⅞ — 16¼
25000	10	Do. A, 5 per cent. preference	10 0 0	5 0 0	13¾ — 14¼
20000	10	Do. A, 5 per cent. do., 2nd issue	10 0 0	5 0 0	13¾ — 14¼
30000	10	Do. A, 5 per cent. do., 3rd issue	10 0 0	5 0 0	
10000	10	Do. B, 4 per cent. maximum	10 0 0	4 4 0	7 — 7¼
20000	10	Do. C, 10 per cent. preference	10 0 0	10 0 0	19¾ — 20¼
12000	25	Do. D, 10 per cent. preference	25 0 0	10 0 0	49 — 50
448875	Stk.	*Commercial*	100 0 0	10 0 0	160 —162
20000	20	Continental Union	20 0 0	8 0 0	20¾ — 21⅛
20000	20	Do., new	12 10 0	8 0 0	¼—½ pm.
10000	20	Do., preference (Grmny.: Strsbg. France: Cette, Nismes, Montargis Vienne, Roanne, Beaucaire, Rueil, Albi. Italy: Milan, Genoa, Parma, Modena, Alessandria, Messina.)	20 0 0	7 0 0	24 — 26
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16 — 17
5000	10	Do., preference	10 0 0	6 0 0	11¼— 12¼
10000	10	Do., ordinary	10 0 0	7 0 0	12 — 13
2500	10	Do., converted	2 0 0	10 0 0	3½ — 4¼
2500	10	Do., converted	2 0 0	7 0 0	2¾ — 3
23406	10	European (Limited)	10 0 0	8 0 0	12½—13 xn.
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	7 10 0	8 0 0	2—3 xn.
4054	10	Foreign and Colonial (Limited)	10 0 0	..	9 — 10
5000	10	Hong kong (Limited)	10 0 0	10 0 0	13½— 13⅞
1560000	108	*Imperial*	100 0 0	10 0 0	157 —159
78000	12½	Do., new shares	12 10 0	7 0 0	15½— 15⅞
1300	100	Do., bonds	£100	10 0 0	195 —198
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Frankfort-on-Maine, Haarlem, Stolberg, and Vienna.)	43 15 0	9 2 6	53 — 54
3000	40	*Independent*	40 0 0	10 0 0	64 — 66
3000	10	Do.	10 0 0	5 0 0	8 — 9
3000	20	Do.	20 0 0	7 10 0	24½— 25½
4500	10	Do., D	3 0 0	10 0 0	7¾ — 8½
378350	Stk.	*London*	100 0 0	10 0 0	161 —163
150000	Stk.	Do., 1st preference	100 0 0	8 0 0	117 —120
14450	Stk.	Do., 2nd preference	100 0 0	6 0 0	
4350	Stk.	Do., 3rd preference	100 0 0	6 0 0	
7622	25	Do., A shares	12 10 0	6 0 0	
26805	All	Do., Debenture stock	100 0 0	8*l*. & 6*l*.	
15000	5	Malta and Mediterranean (Limited)	5 0 0	5 0 0	2¼— 2⅝
6000	5	Do., preference	5 0 0	7 0 0	5 — 5½
20000	5	Mauritius (Limited)	2 0 0	7 0 0	2 — 2⅛
25000	20	Monte Video (Limited)	20 0 0	..	24½— 25
8000	10	Nictheroy, Brazil (Limited)	10 0 0	..	
30000	5	Oriental (Calcutta)	5 0 0	9 0 0	6½— 7
30000	5	Do., new shares	2 10 0	9 0 0	¾— 1¼
10000	5	Ottoman (Limited)	5 0 0	nil.	1¾— 2¼
17500	10	Pará (Limited)	10 0 0	7 0 0	7 — 8
27000	20	*Phœniz*	20 0 0	10 0 0	32 — 33
360000	100	Do., new	55 0 0	7 10 0	69 — 71
144000	Stk.	Do.	100 0 0	5 0 0	92 — 94
5000	20	*Ratcliff*	20 0 0	10 0 0	31½— 32½
36000	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	32½— 33¼
7359	5	Singapore (Limited)	5 0 0	7 10 0	4½— 5
2000	5	Do., preference	5 0 0	7 10 0	5½— 6
1500	32½	Shanghai	32 10 0	12 0 0	30 — 32
4000	50	*South Metropolitan*	50 0 0	10 0 0	85 — 87
4000	12½	Do.	12 10 0	10 0 0	20½— 21½
20000	12½	Do., new shares	5 0 0	10 0 0	9½ — 10½
15000	10	*Surrey Consumers*	10 0 0	10 0 0	15¾— 16
10000	10	Do., new	7 0 0	10 0 0	4¾— 5¼
9000	4	United General (Limerick)	4 0 0	2 10 0	2 — 2⅜
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	14 — 15
1500	10	Do.	10 0 0	7 10 0	11 — 12
2957	10	Do.	10 0 0	7 0 0	
993	10	Do.	3 0 0	7 0 0	
16000	5	*West Ham*	5 0 0	10 0 0	7⅞ — 8
10000	5	Do., new shares	2 10 0	10 0 0	— 4
		WATER COMPANIES.			
60000	10	Berlin	10 0 0	11 10 0	20 — 22
12000	100	Chelsea	100 0 0	6 0 0	118 —120
1800000	100	East London	100 0 0	6 0 0	121 —123
8000	50	Grand Junction	50 0 0	8 10 0	74 — 76
5840	25	Do., ¼ shares	25 0 0	8 10 0	36½— 37½
2160	25	Do., new do.; maximum dividend, 7½ per cent.	25 0 0	7 10 0	31 — 33
4396	100	Kent	100 0 0	6 0 0	121 —123
5339	100	Lambeth	100 0 0	6 5 0	121 —123
1161	100	Do.	20 0 0	6 5 0	
442	100	New River	100 0 0	8 0 0	
4443	100	Do.	30 0 0	8 0 0	36 — 38
400000	100	Do., debenture stock, 4 per cent.	100 0 0	4 0 0	97— 99
3036	100	Southwark and Vauxhall	100 0 0	5 10 0	98— 100
1296	100	Do., preference stock	100 0 0	5 0 0	101— 103
	100	Do., D shares	100 0 0	5 10 0	98— 100
		Do.	..	4 10 0	
	100	Do., new ordinary	..	4 10 0	
1600	100	Do., new ordinary, No. 1	40 0 0	4 10 0	
12172	61	West Middlesex	61 0 0	£6 per sh.	119—121

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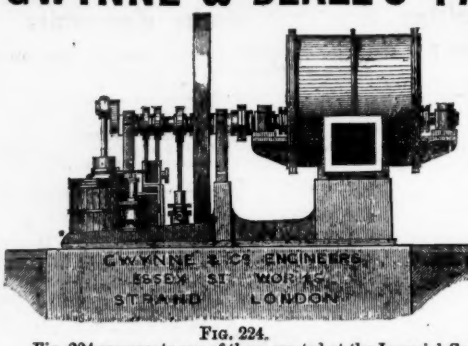

FIG. 224.

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GAS-EXHAUSTING MACHINERY.

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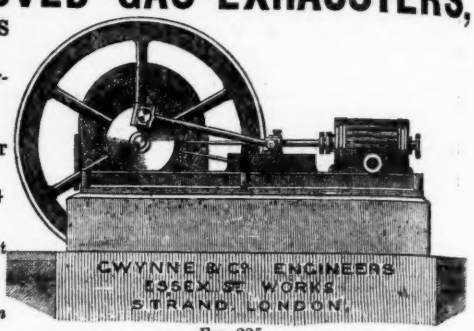

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

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G. & Co. are now manufacturing for a London Gas Company three of their 210,000 *cubic feet Patent Gas Exhausters, and many of all sizes.*

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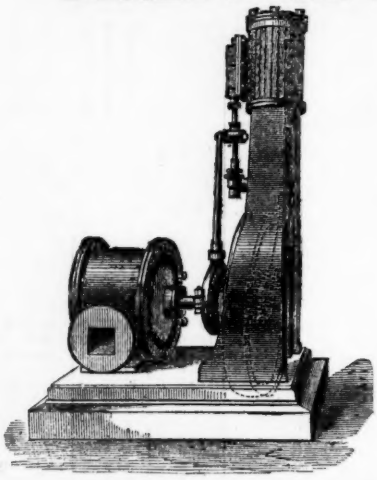
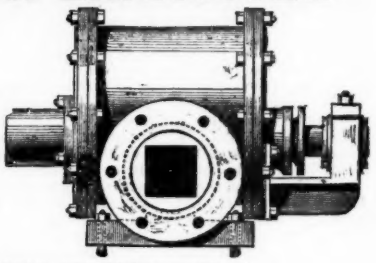


WITH

ENGINE COMBINED

ON

ONE BASE PLATE.



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WANTED, by a tradesman and his son, aged respectively 42 and 20 years, an engagement as Gas-Fitters, Manager or Foreman to Gas-Fitters. Over 20 years experience as fitters to The Gaslight and Coke Company.

Address R. B., 20, Baxter Road, Essex Road, ISLINGTON

WANTED, by the Maryport Town and Harbour Gas Company, a SECRETARY and GENERAL MANAGER for their works. He will have to reside on the premises and to take the meters, and collect the gas bills quarterly. Number of consumers 670. No public lamps.

Applications, stating salary required, to be sent in to the CHAIRMAN, on or before the 30th of March inst.

Maryport, March 12, 1874.

WANTED, a steady man as Main and Service Layer, Meter Inspector, and to Collect. Apply, with references, stating wages required, to J. S. CRANMER, Manager, Gas-Works, Malton, YORKS.

WANTED, a thoroughly efficient man as FITTER and METER INSPECTOR, who also understands the distribution of gas, main and service laying, &c. No one need apply who has not had good experience, and who cannot give good references.

Address, in writing, stating wages required, and where and how long employed, to WILLIAM CUSH, Esq., Bournemouth Gas and Water Company, 26, Nicholas Lane, LONDON.

TO GAS AND WATER COMPANIES, ENGINEERS AND ACCOUNTANTS.

A YOUNG MAN, who has been engaged for six years in the office of a Gas and Water Company, desires a situation as CLERK or COLLECTOR, or would make himself useful in any suitable capacity. Could manage a small work. Unexceptionable references as to character and ability.

Address W. C. H., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a second-hand Gas Roaster, in good condition, capable of cooking 200 pounds of meat; also a second-hand Coal HOT-PLATE.

Particulars and price to be sent to EDWARD L. PARAIRE, Architect and Surveyor, 474½, Oxford Street, LONDON.

WANTED to purchase, 5000 to 10,000 tons of GAS COKE. Waggons can be sent to any station for any proportion of above.

Address G. J. EVERSON, Gas Coal and Coke Merchant, STOURBRIDGE.

VINCENT'S
PATENT IMPROVEMENTS
IN
Apparatus for Manufacturing Gas.

Particulars to be obtained by application to—
MR. LAYARD JONES,
ENGINEER,
25, OLD BROAD STREET, LONDON, E.C.

ON SALE, cheap, a Gasholder, 36 ft. diameter by 12 ft. deep, small Station Meter, and Governor. Also a lot of 6-in. S. and S. Pipes. These having been in use for a short time only are all in good condition.

Apply to A. C. FRASER, 16, St. Swithin's Lane, LONDON.

FOR SALE—A set of Four Dry Lime PURIFIERS, 6 ft. square, five layers of wood sieves in each, wrought-iron covers, and lifting apparatus complete. Also a DRY CENTRE-VALVE, with 7-in. connexions.

The whole of the above is in excellent condition, and will be ready for removal about the beginning of June next.

Offers to purchase to be sent to Mr. S. CROSS, Manager, Gas-Works, Abergavenny, MON.

FOR SALE, and ready for immediate delivery by the Barnstaple Gas Company, about 35 ft. of 12-in. Hydraulic Main, in five lengths; 15 ft. of 16-in. Hydraulic Main; cast-iron Stools for ditto; 21 15-in. Mouthpieces; a number of Ascension-Pipes, Bridges, and Dips; together with a quantity of odd castings suitable for a small work.

Feb. 26, 1874.

WANTED.

THE Directors of the Hexham Gaslight Company will require in July next the services of a competent MANAGER for their works. He must have a thorough knowledge of the manufacture and distribution of gas, setting retorts, main and service laying, as well as the regular routine of a Gas-Work. A certain amount of book-keeping will be required of him, the taking of meters and collecting of accounts. The whole of his services will be devoted to the Company. Security will be necessary.

Applications, with testimonials and references, stating age, salary, and present engagement, to Dr. STAINTHORPE, Chairman of the Hexham Gaslight Company, Hexham, on or before Wednesday, the 1st day of April, 1874.

ADVANTAGES OF GAS FOR COOKING AND HEATING,
BY
MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their gas consumers.

Specimen Copy by post 4d., direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

THE PARTICK, HILLHEAD, AND MARYHILL GAS COMPANY, LIMITED, GLASGOW.

FOR SALE—Upwards of 90 12-ft. lengths of 27-in. Turned and Bored CAST-IRON PIPES; weight of each (average), 28 cwt.

These Pipes are being removed from an old road which has been feued for buildings. They have been in use only 14 months. As good as new, and will be sold cheap. Delivery immediately.

JAMES HISLOP, Manager.

March 14, 1874.

CORPORATION GAS-WORKS, BARROW-IN-FURNESS.

FOR SALE—A set of Four Dry Lime PURIFIERS, 8 ft. square, four layers (wood sieves) in each, galvanised iron covers, hydraulic centre-valve, with 9-in. connexions, and lifting crane complete.

Also TWO CAST-IRON SCRUBBERS, 18 ft. high by 4 ft. diameter, top platform, with wrought-iron railings, wrought-iron ladder, 9-in. connexions, including four Donkin's valves complete.

The above are in good working order, and are only disposed of in consequence of enlargement of works.

An inspection of the above plant, and offers to purchase, will be duly considered.

JOHN LEWIS, Manager.

Feb. 5, 1874.

STATION-METER.

THE Directors of the Warrington Gas Company have for sale a STATION-METER by West and Gregson, capable of passing 20,000 cubic feet per hour. Complete with clock, tell-tale; water-gauge and regulator, valves, bye-pass, and connexions. Discontinued in consequence of being too small.

Apply to JAMES PATERSON, Engineer.

Warrington, Feb. 9, 1874.

HYDRAULIC MAIN AND RETORT FITTINGS FOR SALE.

THE Longton Gas Company have for SALE the Hydraulic Main, Ascension-Pipes, Front Plates, and all the necessary fittings of a bench of brick retorts. There are six settings on the bench, and three retorts to each setting. Constructed on Cliff's plan, and are being pulled down in consequence of alterations.

Offers to purchase to be addressed to Mr. J. M. DARWIN, the Engineer of the Company, Gas-Works, Longton, STAFFORDSHIRE.

March 12, 1874.

TAR AND AMMONIACAL LIQUOR.

THE Macclesfield Corporation Gas Com- mittee are prepared to receive TENDERS for their TAR and AMMONIACAL LIQUOR for a term of One, Two, or Three years.

The Tar, &c., to be removed from the works by the contractor.

Tenders to be in by the 1st of April, 1874.

For further information apply to the Manager.

The Committee do not bind themselves to accept the highest or any tender.

JOHN HENRY LYON, Manager.

Feb. 16, 1874.

CITY OF CARLISLE.

TO MANUFACTURING CHEMISTS AND OTHERS. AMMONIACAL LIQUOR.

THE Carlisle Gas Committee are prepared to receive TENDERS for the AMMONIACAL LIQUOR to be produced at their works for One year from March 31, 1874, to March 31, 1875.

Particulars may be had on application to the Manager of the works, to whom tenders, endorsed "Tenders for Ammoniacal Liquor," are to be delivered, on or before March 26, 1874.

J. HEPWORTH, Manager.

Gas-Works, Carlisle, Feb. 6, 1874.

CAST-IRON PIPES.

THE Directors of the Imperial Gas Company, London, are prepared to receive TENDERS from parties willing to contract for a supply of CAST-IRON GAS-PIPES, from 2 inches to 24 inches in diameter. The particulars and conditions may be obtained by application to the undersigned.

Sealed tenders, endorsed on the outside "Tender for Pipes," are to be sent in on or before Tuesday, the 24th inst.

The Directors do not bind themselves to accept the lowest or any tender.

HARRY CHUBB, Secretary.

Imperial Gas Company's Office, 33, John Street, Bedford Row, London.

March 11, 1874.

TO ARTESIAN WELL SINKERS AND OTHERS.

THE Leamington Local Board of Health are prepared to receive TENDERS for the works required to be done in Sinking a SHAFT and Boring for WATER.

Plan and specification can be seen on application to the Borough Surveyor, Town Hall, Leamington, and any further information obtained on application to Thomas Dale, C.E., Hull Water-Works, and Consulting Engineer to the above Board.

Sealed tenders, endorsed "Tender for Well and Boring," and enclosed under cover, addressed to the CHAIRMAN of the Water-Works Committee, Town Hall, LEAMINGTON, to be sent in on or before Monday, the 23rd instant.

The lowest or any tender not necessarily accepted.

Town Hall, Leamington, March 9, 1874.

YSTRAD GAS AND WATER COMPANY.

TO IRONFOUNDERS AND GASHOLDER MAKERS.

THE Directors of this Company desire to receive TENDERS for a Cast-Iron TANK, 66 ft. 3 in. in diameter by 20 ft. 9 in. deep, with columns, wrought-iron lattice girders, &c.; also for a Single-Lift GASHOLDER suitable thereto. The whole to be erected and fixed complete at the Company's Gas-Works, Ystrad, Rhondda Valley, Glamorganshire.

Plans and specifications, with conditions, may be seen, and forms of tenders obtained, on and after the 16th inst., upon application to Mr. John Lees Cocker, Engineer, Gas-Works, Merthyr Tydfil.

Sealed tenders, addressed to the Chairman of the Directors, to be forwarded under cover to Frank James, Esq., Solicitor, Merthyr Tydfil, on or before the 10th day of April next, endorsed "Tender for Tank" or "Gasholder," as the case may be.

The Directors do not undertake to accept the lowest or any tender.—By order,

FRANK JAMES, Secretary.

Merthyr Tydfil, Glamorganshire, March 10, 1874.

PARA GAS COMPANY, LIMITED.

NOTICE is hereby given that the ADJOURNED ORDINARY GENERAL MEETING of the Shareholders in this Company will be held at the London Tavern, Bishopsgate Street, London, E.C., on THURSDAY, the 19th day of March instant, at Twelve o'clock, in accordance with the resolution passed at the Eleventh Ordinary General Meeting of the Shareholders held on the 20th of December last.

By order,

T. S. BORRADAILE, Secretary.

34, Leadenhall Street, E.C., March 11, 1874.

THE LONDON GASLIGHT COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY MEETING of the Proprietors of the Company will be held at the Freemasons Tavern, Great Queen Street, Lincoln's Inn Fields, on WEDNESDAY, the 8th day of April, 1874, at Twelve o'clock precisely.

MEMORANDUM.—Proprietors must hold capital, stocks, or shares paid up to the amount of £250, to be qualified to attend the meeting.

Three Directors and One Auditor retire by rotation, and, being eligible, offer themselves for re-election.

The Transfer Books will be closed on Tuesday, the 24th day of March, until after the meeting.

By order of the Board,

Dated March 16, 1874. A. J. DOVE, Secretary.

SOUTH METROPOLITAN GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that an ORDINARY GENERAL MEETING of the PROPRIETORS of this Company will be held at the London Tavern, in the City of London, on TUESDAY, the 7th day of April next, at Two o'clock in the afternoon precisely, to receive the Directors Report and the Accounts of the Company for the half year ended the 31st of December last, to declare a Dividend, and to elect a Director in place of Julian Hill, Esq., and an Auditor in place of F. Simpson, Esq., who retire from office at this meeting, but, being eligible, offer themselves for re-election.

Any proprietor, holding 40 shares, intending to become a candidate for either of these offices, must give notice in writing at the Office of the Company, at least 14 days previously to the day of election.

The Transfer Books will be closed from the 25th of March until after the meeting.

By order,

GEORGE LIVESEY, Secretary.

589, Old Kent Road, March 12, 1874.

COKE BREEZE.

THE Directors of the Imperial Gaslight and Coke Company, London, are prepared to receive TENDERS from parties willing to purchase the BREEZE the Company may desire to dispose of between the 1st of April ensuing and the 31st of March, 1875, at their works, in the York Road, King's Cross, St. Pancras; Great Cambridge Street, Hackney Road; Sand's End Lane, Fulham; and St. Leonard's Street, Bromley, Middlesex.

Forms of tender may be obtained on application to the undersigned, to whom the tenders, endorsed "Tender for Breeze," must be sent, or or before Friday, the 20th of March instant.

The Directors will not be bound to accept the highest or any tender.

HARRY CHUBB, Secretary.

No. 33, John Street, Bedford Row, London,

March 12, 1874.

TO ENGINEERS AND OTHERS.

THE Leek Improvement Commissioners invite TENDERS for the following, to be delivered free at the Leek Railway Station:—

A GAS-EXHAUSTER, to pass 15,000 cubic feet per hour, with self-acting bye-pass valves and regulator.

A 4-horse power High-Pressure STEAM-ENGINE, with all fittings complete, and a 6-horse ditto.

A 6-horse BOILER, with all fittings, and an 8-horse ditto. (Only one engine and boiler will be required.)

Also a 3-in. Iron PLUNGER PUMP.

Tenders, with specifications, to be received not later than Four o'clock in the afternoon of Monday, the 23rd inst., and endorsed "Tenders for Gas-Works."

The Commissioners will not necessarily accept the lowest or any tender.

C. HENSHAW, Clerk.

Public Offices, Leek, March 12, 1874.

RETORT SETTING & WORKING.

AN ILLUSTRATED PAMPHLET,

BY E. S. CATHELS.

To be had of Mr. W. B. KING, 11, Bolt Court, Fleet Street, London. Price 2s. 6d., post free.

WORKING DRAWINGS AND SPECIFICATIONS OF CATHELS'S IMPROVED RETORT SETTINGS,

To be Heated by Coke, Tar, or Breeze.

For terms, apply to E. S. CATHELS, Gas-Works, Montreal, Canada.

GAS CONSUMERS MANUAL (Illustrated); Or, HOW TO OBTAIN GOOD LIGHT & CHEAP GAS.

BY E. S. CATHELS. Price 1s. 2d., post free.

LONDON: W. B. KING, 11, BOLT COURT, FLEET STREET, E.C.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

SOCIETY of ARTS.—Cantor Lectures.— A course of Seven Lectures, by Professor Barff, M.A., "On Carbon and certain Compounds of Carbon, treated in reference to Heating and Illuminating," will be given at Eight o'clock on consecutive Monday evenings, commencing on April 13.

Tickets, admitting to the course, can be obtained from the Secretary, price One Guinea.—By order,

P. LE NEVE FOSTER, Secretary.

Society's House, John Street, Adelphi, London, W.C.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

MR. WILLIAM DORE (19 years Gas Engineer and Accountant) may be CONSULTED upon all matters relating to the manufacture and distribution of gas, and the management, accounts, or transfer of gas undertakings.

Office, 4, Picton Place, Neath, SOUTH WALES.

A. C. FRASER, Inventor of the "Patent Ribbed Retorts" in use at over 200 Gas-Works, and late of the Corporation Gas-Works, Middlesborough, is prepared, after 20 years experience, to ADVISE Corporations and Gas Companies in the Erection of New and Improvement of existing Works.

16, St. Swithin's Lane, London, E.C.

MR. NORWOOD EARLE, late of the Dover Gas-Works, is prepared, after 17 years experience, to undertake the duties of SURVEYOR to Gas Companies and Corporations in all matters relating to the Distribution of Gas and Gas Testing. Contracts entered into for the Survey of Mains, Services, Public Lamps, &c., in order to reduce the per centage of unaccounted-for gas to the lowest possible amount.

Valuations for Assessment, Transfer, and other purposes.

Offices, MANSION HOUSE CHAMBERS, 12, Queen Victoria Street, LONDON, E.C.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, WESTMINSTER.

Just published, price 10s. 6d.,

REGISTRATION OF DISTRIBUTORY PLANT.

The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.

W. J. WARNER, Engineer.

South Shields.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, LONDON, E.C.

TO GAS COMPANIES, ENGINEERS, MANAGERS, &c

DESIGNS & PLANS of GAS-WORKS, EXTENSIONS AND ALTERATIONS,

DRAWINGS AND TRACINGS OF GASHOLDERS, TANKS, RETORTS, RETORT-HOUSE FITTINGS, ROOFS, GIRDERS, CONDENSERS, SCRUBBERS, ENGINES, BOILERS, EXHAUSTERS, PURIFIERS, GOVERNORS, VALVES, &c., Prepared with despatch, and at a moderate rate.

HILL AND CO.,

23, Southampton Buildings, Chancery Lane, W.C.

Will be ready early in April, price 7s., by Post 7s. 3d.,

A SECOND EDITION (feap. 8vo., morocco gilt)

OF

THE GAS MANAGER'S HANDBOOK;

CONSISTING OF

Tables, Rules, and Useful Information for Gas Engineers, Managers,

And others engaged in the Manufacture and Distribution of COAL GAS.

BY THOMAS NEWBIGGING, A.I.C.E.

In the present edition the work has undergone careful revision, much new matter has been added, its form has been altered to suit alike the pocket and the desk, and every effort has been made to increase its usefulness, and render it worthy of the position it aspires to fill.

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

E. GODDARD,
GAS-WORKS, IPSWICH,
SOLE AGENT FOR
EDGE'S PATENT
FOR REMOVING THE
CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

BOUCK & CO., LIMITED,
MANUFACTURING CHEMISTS,
TAR AND AMMONIA DISTILLERS, &c.,
MILES PLATTING, MANCHESTER.
WM. LITCHFIELD, SECRETARY.

CONTRACTORS for the PURCHASE of GAS TAR AND AMMONIACAL LIQUOR,
Also of their products.

EMILY GIBBONS,
Dibdale Fire-Clay Works & Colliery,
Near STOURBRIDGE.
(ESTABLISHED 1834.)
MANUFACTURER OF EVERY DESCRIPTION
OF
Burs, Lumps, Stays, Shields, Blast Furnace and other Bricks & GAS-RETORTS.
Red and Blue Clay Goods, Engineering and other Ironwork, and Fittings supplied.

N.B.—Above works having been recently enlarged, orders of any magnitude for HOME or EXPORT Trade will receive immediate attention.

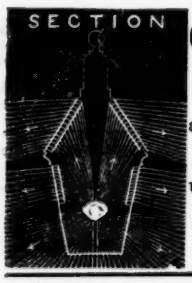
TO GAS COMPANIES.
PATENT FUEL AND LIME CEMENT
FROM GAS LIME.

This invention (protected by three patents) consists in a new method of turning the foul lime of Gas-Works to profit. The process is very simple and inexpensive, and can be worked by Gas Companies at a very small outlay.

By simply mixing the foul lime with tar it is converted in the first instance into an excellent fuel. By burning this fuel a very valuable material for building purposes is obtained, which can be used either as lime or cement or plastic. When used as cement it will be found equal to the best Portland in durability and hardness.

Licences to work the invention will be granted by the Patentee to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.



THE PATENT CATOPTRIC LAMP
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON,
INVENTOR AND PATENTEE.

ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
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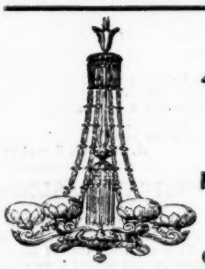
GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.



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MANUFACTORY AND SHOW-ROOMS:
BROAD STREET, BIRMINGHAM.
ESTABLISHED 1807.
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.
TABLE GLASS OF ALL KINDS.
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

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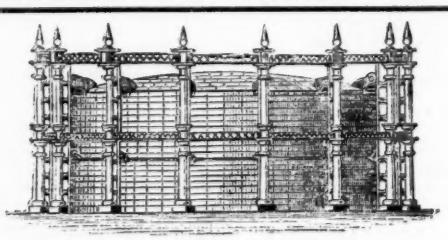
GAS-METER MANUFACTURERS, BRASSFOUNDERS & FINISHERS,
ATLAS METER-WORKS, OLDHAM.
CONSUMERS WET & DRY GAS-METERS ON THE MOST APPROVED PRINCIPLES.
STATION-METERS, GOVERNORS, PRESSURE-REGISTERS,
And every Description of Gas Apparatus.
GAS, STEAM, AND WATER FITTINGS.

HOPE IRON WORKS,



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GAS ENGINEERS & CONTRACTORS,
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GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.
N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

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IN THE
PURIFICATION OF ILLUMINATING GAS,
BY
Spence's Patent Dry Copperas,
The only Purifying Material which removes, by one process, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of four years at some of the largest Gas-Works in the Kingdom.
TESTIMONIALS SENT ON APPLICATION.

SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,
VICTORIA CHEMICAL WORKS, ASHTON NEW ROAD, BRADFORD, MANCHESTER,
Manufacturers of SPENCE'S PATENT DRY COPPERAS; GREEN COPPERAS;
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CONTRACTORS FOR THE PURCHASE OF SPENT OXIDE.
ALL COMMUNICATIONS TO BE ADDRESSED TO THE WORKS.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

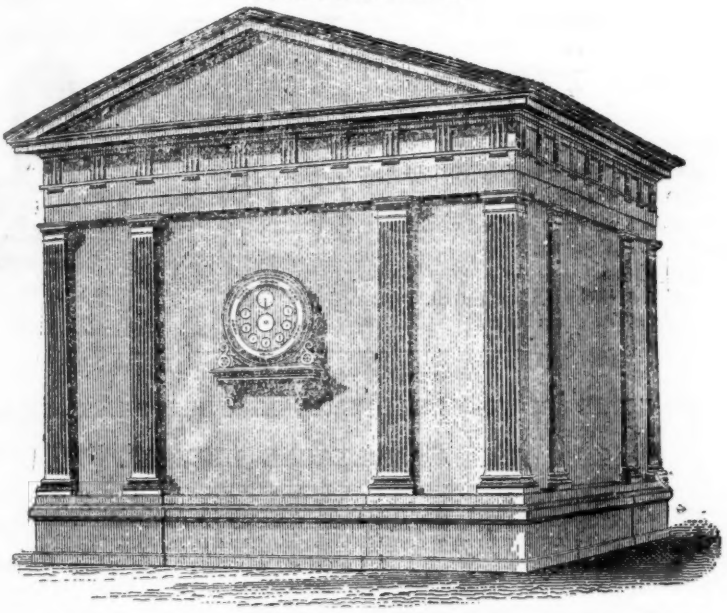
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

WATER-METERS SUITABLE FOR ALL PRESSURES.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

19, NORTHUMBERLAND STREET, STRAND, W.C.

MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

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STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

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A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

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Plain, Turned and Bored, and Coated.
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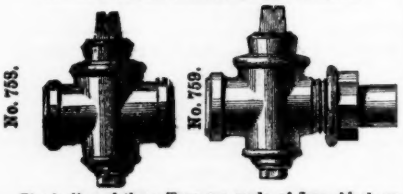

The bodies of these Taps are made of Iron, black or galvanized, and the Plugs of Patent Metal. They are warranted not to set fast or corrode as do iron or brass Cocks, will always work easily, are strong, well made, durable, of little or no intrinsic value, and, therefore, not likely to be stolen; and the PRICES are (especially upon the larger sizes) FULLY 50 PER CENT. LESS THAN BRASS COCKS.

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THE OMOA AND CLELAND IRON AND COAL COMPANY, LIMITED,
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OF A VERY SUPERIOR QUALITY.
This Coal, according to the report of the analyst, yields 11,110 cubic feet of gas per ton, and has an illuminating power of 33·97 candles per 5 cubic feet per hour.
Copies of the analysis and full particulars as to price, &c., may be had on application to the SECRETARY of the COMPANY, 172, West George Street, GLASGOW.

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WAS AWARDED, AT THE
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"The simplest machine of its kind."—*Engineering.*

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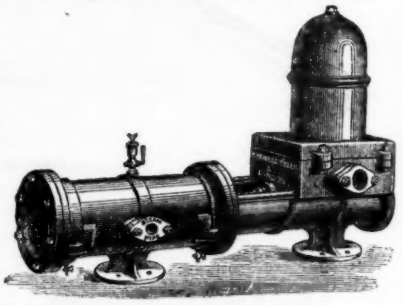

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One selected from amongst many Testimonials received by H. T. & Co.:—

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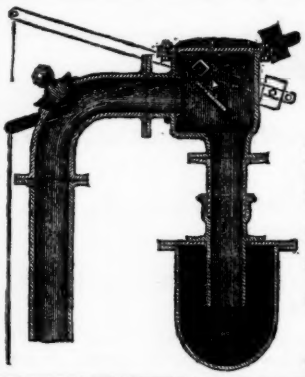

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By the adoption of this Valve, which is neat, cheap, and most effective, the necessity for a dip-pipe, together with liquid, in what is now the hydraulic main, is superseded, and the pressure consequent upon the dip entirely removed, a desideratum which has been sought for by so many engineers of late.

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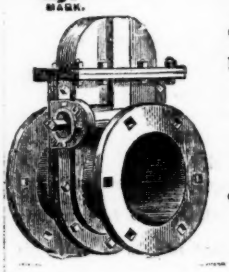

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CANNEL COAL.
COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
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Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.
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POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
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Of superior quality, delivered at any station in England and Wales.
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